TO STUDY THE CLINICAL, RADIOLOGICAL AND MICROBIOLOGICAL PROFILE OF PATIENTS WITH BRONCHIECTASIS IN A TERTIARY CARE HOSPITAL

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Branch – XVII

GOVERNMENT KILPAUK MEDICAL COLLEGE & HOSPITAL

CHENNAI, TAMIL NADU

APRIL 2019

BONAFIDE CERTIFICATE

This is to certify that the dissertation "To study the clinical, radiological and microbiological profile of patients with bronchiectasis in a tertiary care hospital" is the Bonafide work done by **Dr. R. DHIVYA** during her **MD (Tuberculosis and Respiratory Diseases)** course from May 2016 to April 2019 at Government Kilpauk Medical College, Chennai.

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DECLARATION BY THE SCHOLAR

I**, Dr. R. Dhivya,** solemnly declare that the dissertation titled "To study the clinical, radiological and microbiological profile of patients with bronchiectasis in a tertiary care hospital' has been prepared by me. This is submitted to "**The Tamil Nadu Dr. M.G.R. Medical University, Chennai"** in partial fulfilment of the requirement for the award of M.D degree examination branch XVII **Tuberculosis and Respiratory Diseases** from May 2016 to April 2019.

Place: CHENNAI **(**Dr. R. Dhivya)

Date: Signature of the candidate

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INTRODUCTION

BACKGROUND OF THE STUDY:

- Bronchiectasis is a disabling disease entity that remains under-diagnosed with significant delay in initiating appropriate therapy and chronic disease management. Treatment remains largely palliative as it has historically been under represented in medical research

- It has become increasingly recognised that treatments for bronchiectasis cannot be extrapolated from other chronic respiratory diseases and more studies are needed to better understand disease pathogenesis and to establish an optimum approach to the management of this debilitating disease.

- This study was done with an aim to identify the common presentation pattern of the disease, etiology, PFT pattern, radiological type and involvement, microbiological profile, complications and the correlation of these parameters with death, so that the disease could be identified at an early stage, so as to improve it's management, prevent comorbities and improve outcome and patient's quality of life.

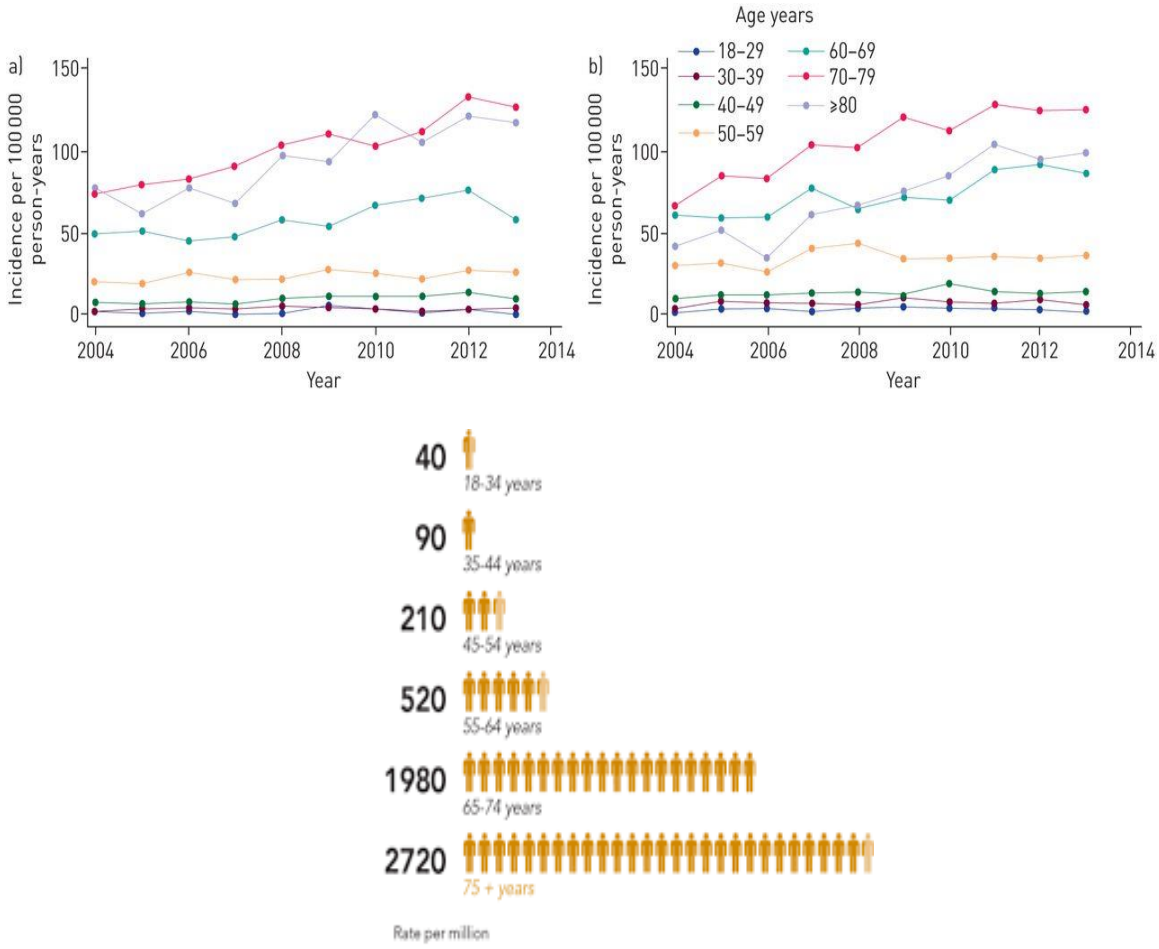
Bronchiectasis is defined as an irreversible dilatation and destruction of one or more medium sized bronchi, with a reduction in clearance of respiratory secretions and in the expiratory airflow. The disease can lead to recurrent lower respiratory tract infections, worsening of pulmonary functions, respiratory failure and pulmonary hypertension, resulting in a deterioration in quality of life, with increased morbidity and premature mortality[1]. Persistent airway inflammation and mucus hypersecretion may also predispose to mucus plugging and bronchial wall thickening and destruction, resulting in impaired lung function [2]

It is derived from the greek word, bronchion which means windpipe and ektasis which means stretching out. The condition was clearly described by Laennec in 1819 after a post mortem examination of the lungs of an infant who died following whooping cough. Bronchiectasis is not a separate disease as such but a result of various affections of the lungs and bronchi. It's anatomical changes represent a common end stage of a variety of pathological conditions of the lung [19]

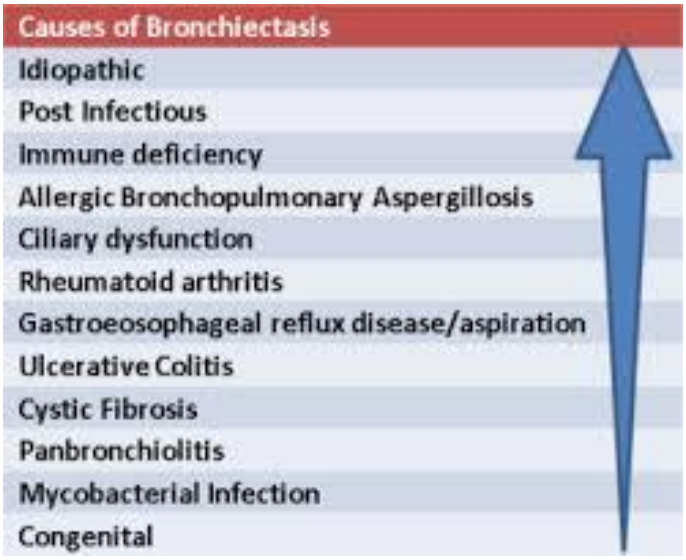
There are varied pathways that lead to the development of bronchiectasis. Broadly bronchiectasis may develop because of an incidental event or an episode that does not reflect the patient's intrinsic host defences. It also evolves due to any condition that is inherent in the patient's genetic constitution. A central issue in understanding of the pathogenesis of bronchiectasis is whether the infection is truly the proximate cause of bronchiectasis or whether these infections develop because of an underlying predisposing condition [20]

PREVALENCE:

It was a common disabling disease in the pre antibiotic era and incidence has now reduced on advent of vaccination and antibiotics. In the US it's prevalence is estimated to be 4.2 per 100000 and 272 per 100000 among those who were 75 years or older. In most series, 60% of the affected population were women. The average annual bronchiectasis associated hospitalization rate from 1993 to 2006 was 16.5 per 100000 with an average annual percentage increase of 2.4% for men and 3% for women [20]



ETIOLOGY OF BRONCHIECTASIS:



RADIOLOGICAL CLASSIFICATION:

Cylindrical – failure of the involved airways to taper progressively in their distal course

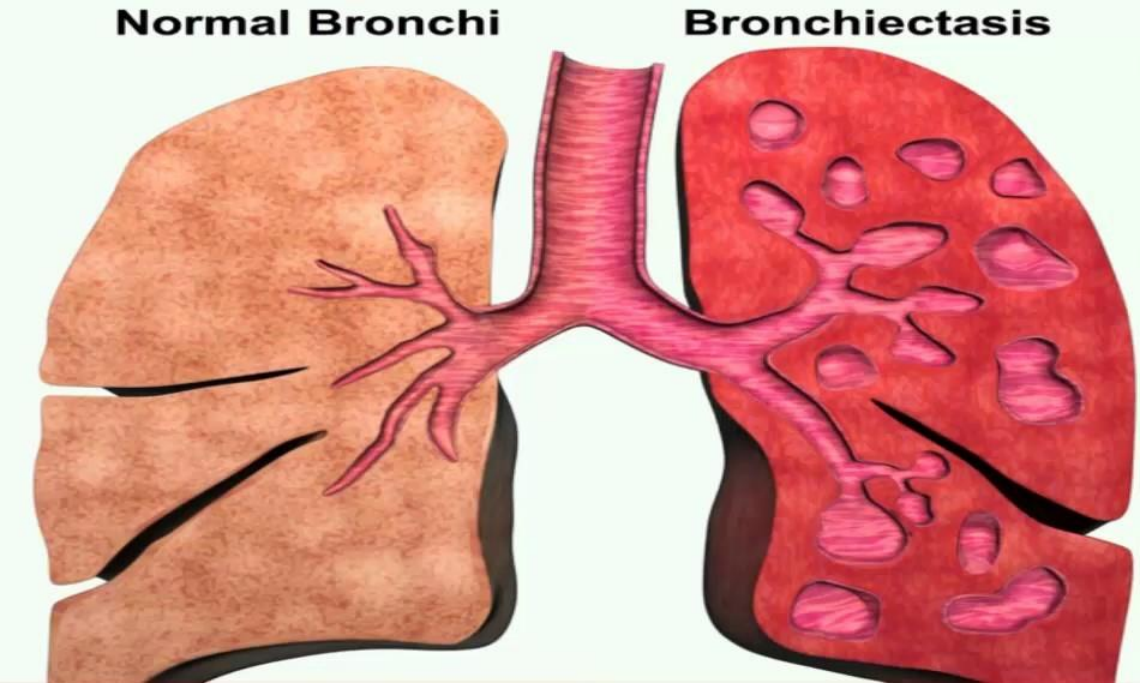
Varicoid – irregular dilatation, narrowing and out pouching of the airways

Cystic (saccular) – focal or cystic distortion of the distal airways

Bronchiectasis may be wet or dry depending upon the presence of secretions. It helps in lobe localization, with the former more predominant in lower lobes due to dependent zones predisposed to frequent colonization [21]

PATHOGENESIS OF BRONCHIECTASIS:

In normal lungs, airways are held patent by a combination of negative intrapleural pressure, cartilaginous rings of trachea and the large and medium sized airways. As the lung undergoes fibrotic changes consequent to any disorders such as sarcoidosis, interstitial lung disorders, or infections such as TB, the local retractile forces result in fixed dilation of the airways, or “traction” bronchiectasis [21]



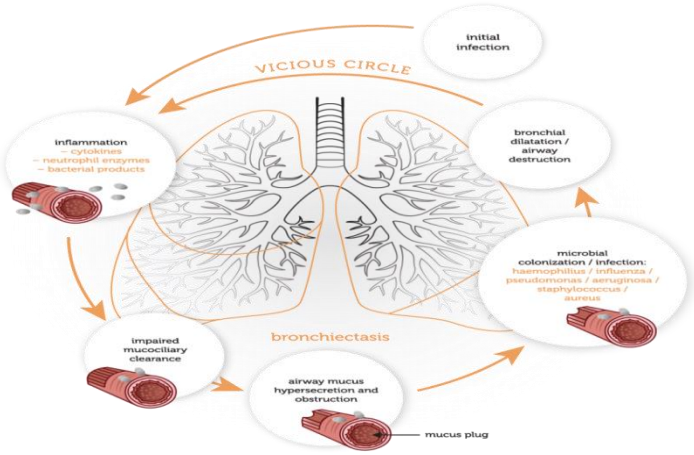
THEORIES OF BRONCHIECTASIS:

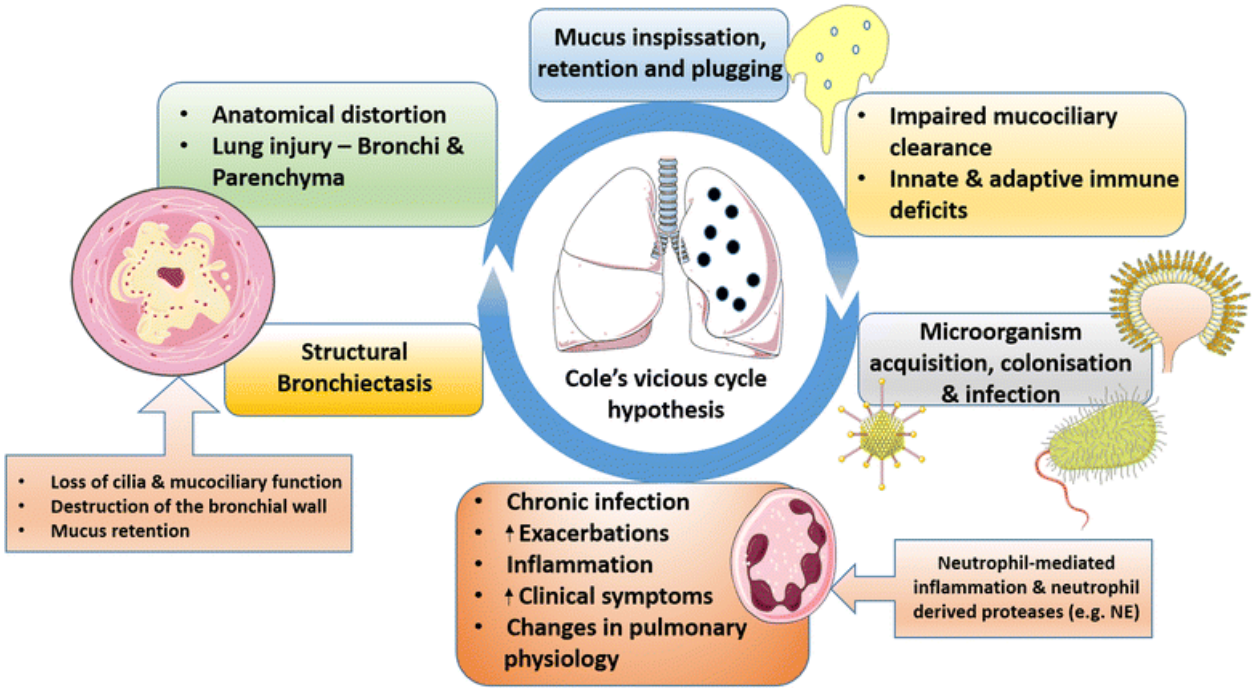
- Atelectasis theory
- Pressure of secretions theory
- Pulsion theory
- Traction theory

Weakness of the airways contributing to the development of bronchiectasis may take different forms. Classical post infectious bronchiectasis presumably is mediated in part by chronic damage to walls of the airways, resulting in the secondary loss of structural integrity. This is coupled with scarring and also loss of volume of the local lung units, leading to regional increase in retractile forces. Examples of primary weakness of the airways contributing to bronchiectasis include Williams-Campbell syndrome, Mounier-Kuhn syndrome, Marfan syndrome, and relapsing polychondritis.

The extraordinary collapsibility of the airways, virtually obstructing the bronchi may lead to such amplified airway compressibility which impedes the air-driven propulsion of secretions out of the bronchial tree and helps them propagate the chronic or recurring infections [19]

PATHOPHYSIOLOGY OF VICIOUS CYCLE





CLINICAL APPROACH TO THE PATIENT WITH SUSPECTED BRONCHIECTASIS

History: Recurrent lower / upper respiratory tract infections, pneumonia

Daily mucopurulent sputum production

Initial studies: CBC with differential count

Chest x-ray

Immunoglobulins IgM, IgG, IgA

Sputum: bacterial culture and sensitivity, mycobacteria, fungi

Confirm diagnosis: HRCT chest

Other studies: Sweat chloride and/or genetic panel for CFTR genes

Allergic bronchopulmonary aspergillus panel (IgE, precipitins, or skin test)

Bronchoscopy (for cultures, to relieve obstruction)

Nasal nitric oxide

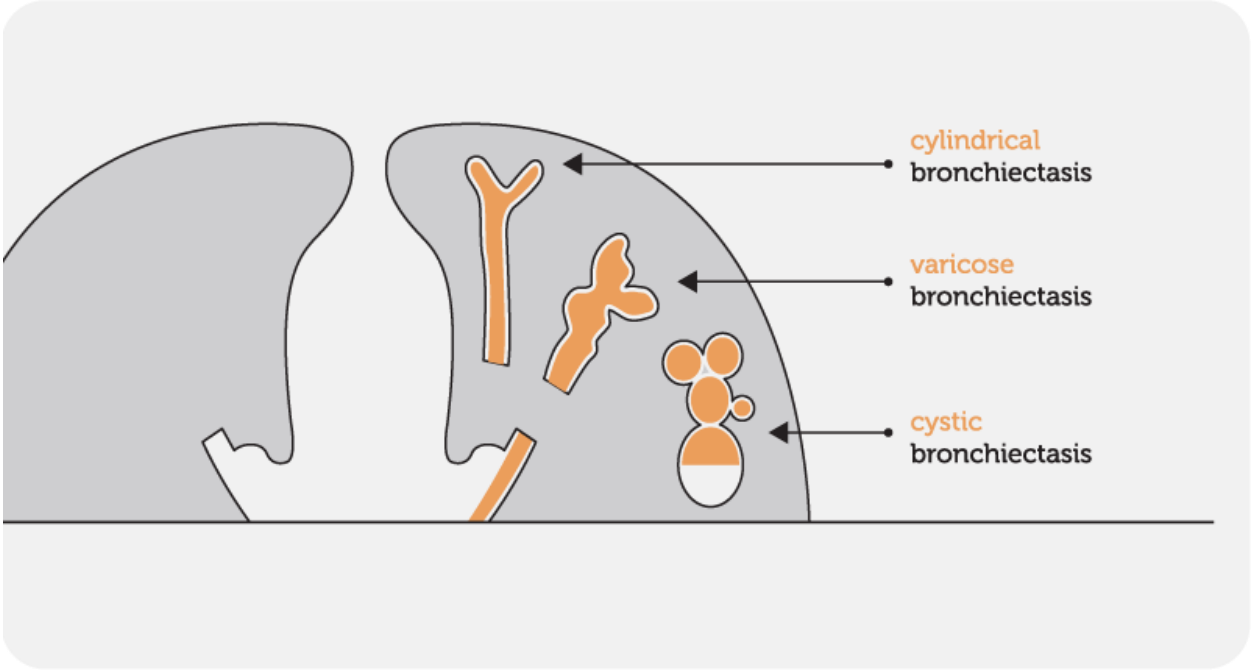
Alpha-1 antitrypsin level; phenotype

Pulmonary function test (spirometry pre and post bronchodilator)

Serum antibody response to bacterial antigen challenge, e.g., pneumococcal vaccine

TYPES OF BRONCHIECTASIS:

- Cylindrical bronchiectasis is described as failure of the involved airways to taper progressively in their distal course. Usually, in this condition the bronchial walls are smooth or regular.
- Varicoid bronchiectasis is an allusion to varicose veins and is marked by irregular dilation, narrowing, and outpouching of the airways
- Saccular bronchiectasis, also known as cystic bronchiectasis, includes a focal or cystic distortion of the distal airways; it may be isolated or may be more confluent, producing the appearance of bronchiectatic consolidation and volume loss. [20]



REVIEW OF LITERATURE

Bronchiectasis is a permanent and usually a progressive bronchial dilation resulting from an infection and chronic inflammation of the airway, leading to destruction and remodelling of the bronchial wall. Bronchiectasis is associated with chronic and purulent expectoration, multiple exacerbations and progressive, disabling dyspnoea. These events gradually worsen the health-related quality of life and lung function of affected patients. In recent years, bronchiectasis has become a major health concern for several reasons: a significant increase in the number of diagnosis, the increase in the mortality rate and in hospital admissions, the considerable health costs involved, it's negative impact on the quality of life and pulmonary function of patients (annual loss of nearly 50 mL of forced expiratory volume in 1 s (FEV1)) and it's deleterious effects on underlying diseases

The incidence and prevalence of bronchiectasis are not well known and underestimated in developing countries. Although the prevalence declined over the past years in societies with high socioeconomic status, probably due to the development of preventive medicine, especially childhood immunizations, and improvement of the living conditions and widespread use of antibiotics, nowadays bronchiectasis has been recognized more , mainly due to the frequent use of high-resolution computerized tomography(HRCT)

So it is important to study the clinical, radiological and microbiological parameters of patients with bronchiectasis, so as to identify the symptoms, treat them with susceptible antibiotics and prevent complication [21]

BRONCHIECTASIS VS SYMPTOMATOLOGY:

Bronchiectasis may produce no symptoms and physical signs may be entirely absent. The classic clinical manifestations of bronchiectasis are daily cough and mucopurulent sputum production. Cough is invariably present and often may be the only symptom for years. Purulent, tenacious sputum production, frequently worse in the morning (having accumulated during recumbency in sleep) is present in most patients. Sputum production may be intermittent, being affected by recurrent infections, bronchial plugging, and antibiotic therapy. “Dry bronchiectasis” presenting as cough, minimal sputum expectoration, and/or hemoptysis is occasionally described. Hemoptysis may be seen in 40% to 70% of patients and may vary from blood streaks to large clots.

Dyspnea is regarded as a late symptom, other than when it occurs with pneumonia, pleurisy or ABPA with asthma, and usually indicates widespread lung disease with extensive destruction and fibrosis. Other coexisting symptoms include general tiredness and malaise and those of upper respiratory infection, particularly sinusitis [19]

According to Mehmet Ali Habesoglu et al,cough (83.6%) and sputum (83.6%) were the most frequent complaints. Most of the patients were detected to be symptomatic in middle age. They predominantly complained of productive cough and dyspnea at the initial evaluation. While 8 cases were admitted because of first-time hemoptysis, there was a history of hemoptysis in almost one-third of the patients. Hemoptysis was established sometimes as the only reason of assessment and sometimes even as a life-threatening complication.

BRONCHIECTASIS VS ETIOLOGY:

The etiology of bronchiectasis varies between different populations. Immune deficiency syndromes, metabolic and ultrastructural defects are predominant etiologic factors in developed countries, while bacterial and viral infections continue to be the major causes in developing countries.

According to a study by hobesoglu et al, Pneumonia including tuberculosis infections in younger ages or childhood infections such as measles or pertussis was determined to be the reason of bronchial distortion in most of the patients [(1)]

According to a study by Loubinger et al, Idiopathic aetiology accounted for more cases[(6)] (56.0%)

According to a study by Sara laonni et al, among the entire study population, the etiology of bronchiectasis was identifiable only in 60% of patients. Excluding idiopathic bronchiectasis, the first five most commonly identified etiologies were postinfective (20%), COPD related (15%), connective tissue disease related (10%), immunodeficiency related (5.8%), and asthma related (3.3%). There was no significant difference in the etiology of bronchiectasis vs different levels of disease severity, with the exception of a higher prevalence of COPD–related bronchiectasis ($P < 0.001$) and a lower prevalence of idiopathic bronchiectasis ($P = 0.029$) in patients with severe disease [25]

According to Shoemark et al, among a total of 165 bronchiectasis patients an underlying cause was identified in 122 (74%) and this affected management in 61 (37%). The common aetiologies were: post-infection (52), primary ciliary dyskinesia (17), ABPA (13), and immune deficiency (11). 43 patients had idiopathic bronchiectasis. These patients had symmetrical predominant lower lobe disease with onset of chronic chest and sinus symptoms in middle age

According to Guan V.J et al, among 148 patients most of whom had mild to moderate bronchiectasis, Idiopathic (46.0%), post-infectious (27.0%) and immunodeficiency (8.8%) were the most common etiologies. Miscellaneous etiologies consisted of asthma (5.4%), gastroesophageal reflux (4.1%), aspergillosis (2.7%), congenital lung malformation (2.0%), Kartagener syndrome (1.4%), RA (1.4%),

COPD(0.7%), Young's syndrome (0.7%), yellow nail's syndrome (0.7%), eosinophilic bronchiolitis (0.7%) and foreign bodies (0.7%). There was no notable difference in clinical characteristics between idiopathic and known etiologies. [2]

According to Qi.Q, Wang et al, among a total of 476 adult patients with bronchiectasis of Chinese ethnicity, Idiopathic (66.0%) was the most common cause, followed by post-tuberculosis (16.0%). Other uncommon causes included post-infective (3.8%), immunodeficiency (3.8%), ABPA (4.0%), rheumatic diseases (4.4%) and primary ciliary dyskinesia (0.9%). Patients with post-tuberculosis bronchiectasis had a higher frequency of upper lobe prediliction ($P < 0.05$)

BRONCHIECTASIS VS LUNG FUNCTION:

Study by Wei gie guan et al showed that lung function impairment was associated with aberrant chest radiological findings and sputum bacteriology (esp. P. aeruginosa) in clinically stable bronchiectasis. Significant clinical impairment should raise the alert of poorer FEV1 and DLCO. It further showed that FVC and FEV1 were significantly reduced during acute exacerbations and recovered during convalescence, even when stratified by the magnitude of FEV1 and DLCO impairment. Other spirometric parameters were less significant during bronchiectasis exacerbations. Sputum bacteriology was, in part, associated with poorer spirometry and (or) diffusing capacity. Infection with P. aeruginosa, has been linked to poorer lung function [2]

Compared with nil colonization or intermittent isolation, the chronic P. aeruginosa infection has been shown to signal poorer FEV1, FEV1/FVC, DLCO and a higher level of residual volume, indicating the presence of airway obstruction and dyshomogneity. Chronic colonization by P. aeruginosa has also been associated with more rapid lung function decline.

In another recent literature by Rogers et al, bronchiectasis patients with P.aeruginosa and Haemophilus influenzae-dominated bacterial communities yielded markedly poorer lung function. More importantly, apart from their higher levels of serum C-reactive protein, sputum interleukin-8 and interleukin-1b, patients whose sputum was predominated by P.aeruginosa harbored the lowest levels of lung function and more frequent exacerbations.

The changes in spirometry of bronchiectasis exacerbation partially resembled those of that of chronic obstructive pulmonary disease. According to a study by Mehmet Ali Habesoglu et al, FEV1 and FVC values of patients with cystic type were lower than the values of those with non-cystic type bronchiectasis. Additionally, a mixed pattern was detected more commonly in the cystic group [(1)]

In a study by King et al, in subjects with bronchiectasis there was a significant correlation between low FEV1 values and smoking, extent of disease on X-ray/HRCT chest and isolation of Pseudomonas in the sputum. Whooping cough and pneumonia in childhood have also been shown to be associated with a small decrease in adult FEV1 [5]

In the study by Jin Hwa Lee et al, FVC, FEV1 and FEV1/FVC were significantly associated with the CT score. FVC and FEV1 were also associated with the number of bronchiectatic segments, whereas FEV1/FVC values were associated with number of emphysema segments, suggesting that FEV1/FVC reflects an obstructive pathology, like emphysema. PFT parameters may be normal in minimal degree of bronchiectasis. The severity of morphologic changes which are observed on HRCT influences these pulmonary functional parameters, and bronchiectasis of increased severity causes a gradual functional decline.

Previous studies emphasized obstructive pulmonary insufficiency in bronchiectasis, related to morphologic changes and bronchial responsiveness. Focal stenosis and the eventual obliteration of peripheral bronchial contours, together with secretions and exudate, and associated emphysematous changes all contribute to pulmonary functional deterioration associated with obstructive changes. However, irreversible structural destruction contributes to a reduction in lung volume and obstructive changes, which present more commonly as the mixed type. Moreover, the extent and severity of the morphologic abnormalities determine the degree of volume impairment.

According to Wie-jie Guan et al, there was significant reduction in FVC, FEV1 and MMEF during exacerbations. The median changes were within 5% of baseline levels. [2]

According to MC.Donnell et al, FEV1 is a robust and easily recorded marker of disease progression in patients with bronchiectasis. Studies have shown an annual FEV1 decline ranging from 33 to 55 ml/year. Factors associated with accelerated decline include radiological (HRCT) extent of bronchiectasis and bronchial wall hypertrophy, chronic Pseudomonas aeruginosa carriage and exacerbation frequency [13]

BRONCHIECTASIS VS RADIOLOGY

The plain chest radiograph is an unreliable means of diagnosing bronchiectasis. Nevertheless certain plain radiographic features may be taken in support of a clinical diagnosis or may lead to further investigation using HRCT, which has now displaced bronchography as the confirmatory investigation of choice. The chest x-ray may be abnormal and show the presence of increased pulmonary markings, ring-like structures, atelectasis, dilated and thickened airways (tram lines), and mucus plugging (finger-in-glove) appearance; however, in some of the patients, chest radiograph may be normal even in the presence of bronchiectasis. Evidence of dilated bronchi seen as: ring shadows, parallel lines, solid tubular opacities

HRCT is now the test of choice for the diagnosis of bronchiectasis. HRCT can accurately diagnose bronchiectasis, localize, and describe the areas of parenchymal abnormalities, and identify bronchiolar abnormalities and mucus plugging. It also can identify focal areas of air trapping which is an indicator of small airway disease (mosaic attenuation). A luminal diameter greater than 1.5 times the adjacent vessel is indicative of bronchiectasis. Other findings include bronchial wall thickening and small airway plugging with debris (tree-in-bud).

Cartier et al. found that bilateral predominantly upper lobe bronchiectasis is seen most commonly in CF, ABPA, and sequelae of tuberculosis. A middle-lobe distribution with irregular ground glass nodules is very characteristic of NTM. Lower lobe predominance is seen in most other causes. [26]

Reid described a correlation between the pathological and bronchographic findings in bronchiectasis; since then, this has been the most widely used classification. In cylindrical bronchiectasis, the bronchi are regularly outlined (tubular), dilated in diameter, with straight walls, often coming to a straight abrupt end instead of a tapering end due to the obstruction of the peripheral bronchial tree by secretions, casts, and inflammatory wall edema. Varicose bronchiectasis is charecterised by the presence of irregular dilatations, out pouchings, and tortuosity of the airways.

Saccular (cystic) bronchiectasis is characterized by the presence of cystic distortion of the distal airways which may be focal or more generalized, resulting in saccules that appear as cluster of grapes. Traction bronchiectasis is a term used to describe the dilated airways seen in diffuse pulmonary fibrosis which is secondary to fibrous tissue traction and elevated negative intra thoracic pressure. It should be distinguished from usual bronchiectasis, because of the lack of intrinsic airway pathology and minimal sputum expectoration [19]

According to a study by Habesoglu et al, Pathological findings were not detected on chest X-ray only in 18 patients. Increase in pulmonary marking was the most common radiologic finding (71.1%). These findings are commonly described as chronic fibrotic changes. Honeycombing (34.9%), loss of lung volume (30.6%), and pleural abnormalities (8.5%) were the other X-ray findings. According to radiologic examination with HRCT, the predominant type of bronchiectasis was cystic in 143 cases (47%) and non-cystic in 161 cases (53%). More than one type of bronchiectasis was observed in 74 subjects (24.3%) [1]

In HRCT, the predominant type of bronchiectasis was cystic in 143 cases (47%) and non-cystic in 161 cases (53%). More than 1 type of bronchiectasis was observed in 74 patients (24.3%). A median of 2 lobes was involved. A single lobe was affected in 75 cases (24.7%), as with all six lobes in 8 cases (2.6%). It was often distributed to both the lower lobes.

The extent and type of the disease can also be determined with HRCT. In nearly half of the patients (47%), cystic type was detected commonly. It was observed that patients with cystic type had worse clinical picture than the others, with daily sputum production rather than having only during respiratory tract infections, more common life-threatening hemoptysis, more significant auscultation findings and more frequent clubbing and chronic respiratory failure as a complication. As compared to the other types, cystic type bronchiectasis was stated to increase the bacterial colonization in airways (especially Pseudomonas), leading to more significant worsening of pulmonary functions and also more frequent development of pulmonary hypertension.

In a study by Paul.T.King et al, radiological examination showed that most patients (80%) had 2 or more lobes with evidence of bronchiectasis and the most common pattern was a b/l lower lobe involvement. The most commonly involved lobe was the right lower lobe (RLL) which was affected in 69% of patients. The lobe least involved was the right upper lobe (RUL) affected in 13% [(5)]

According to Loebinger et al, CT features did not reach a statistical significance for an independent effect on mortality when reentered into the modeling eq uations. The CT variables are nevertheless very useful in order to appreciate the pathogenetic correlates of the functional indices. The CT scan correlates with that of the lung function parameters, with an independent impact on mortality, TLC, RV/TLC and KCO were mosaicism, wall thickness and mosaicism, and emphysema, respectively [(6

According to a study by Lynch et al, 123(47%) had involvement of all 6 lobes, 53 (20%) had involvement of five lobes, 42 (16%) had involvement of four lobes, 14 (5%) had involvement of three lobes, 16 (6%) had involvement of two lobes, while 13 (5%) had one lobe involvement. Bronchiectasis was most prevelant in right lower lobe in 225 patients (86%), lingular bronchiectasis in 84%, left lower lobe bronchiectasis in 85% and right middle lobe bronchiectasis in 83%. It was slightly less common in the upper lobes, with 75% in right upper lobe and 67% in left upper lobe [9]

Correlation between the CT scores and clinical parameters (mean daily sputum volume and dyspnoea scale) were weak. The bronchiectasis score correlated inversely with that of FEV1 and FVC. 33% patients had pure cylindrical bronchiectasis, while 25% had varicose type and 62% had cystic type of bronchiectasis. 73% of the patients with cylindrical bronchiectasis were current or former smokers, while 46% with varicose and 42% with cystic bronchiectasis. Sputum culture showed pseudomonas in 6% of cylindrical bronchiectasis, 17% in varicose, while in cystic bronchiectasis it was 35%.

Sputum production per day was highest in cystic type. Patients with cylindrical type were more likely to have obstructive pattern of PFT, while it was mixed in cystic type. FEV1/FVC ratio was lower in patients with cylindrical and cystic type.

In a study by Jin Hwa Lee et al, with stable bronchiectasis, radiologic findings such as cystic type, high CT score, and a large number of bronchiectatic segments were highly relevant to functional impairment. In particular, the CT score was found to be the most important predictor of FVC, FEV1, and FEV1/FVC. P.aeruginosa was identified as the predominant colonizing bacteria, and the presence of air-fluid levels as a predictor of bacterial colonization [15]

BRONCHIECTASIS VS MICROBIOLOGY:

62 patients underwent sputum analysis. In 45 patients (73%) the sample was obtained spontaneously, but only 29 (64%) fulfilled the Murray-Washington criteria and were further processed for culture. In 17 patients (37%) who were unable to expectorate sputum spontaneously, the sputum sample was obtained using induction technique with 13 (76%) being valid for culture. Culture of the 42 good quality sputum samples (both spontaneous and induced) yielded 26 PPMs which corresponded to 22 patients (52%) and 48 non-PPMs which corresponded to 25 patients (60%). Protected brush specimens were obtained from 75 patients and culture yielded 51 PPMs in 46 patients (61%) and 36 non-PPMs in 22 patients (29%). Culture of BAL fluid samples from 59 patients yielded 38 PPMs in 33 patients (56%) and 25 non- PPMs in 19 patients (32%).

2 different PPMs were found in the sputum samples from three patients, in the PSB samples from five patients, and in the BAL fluid samples from three patients. On pooling the results obtained from the different techniques used to assess bronchial colonization, 49 of the 77 patients had significant PPM counts in the respiratory tract, giving an overall colonization rate of 64%. Community acquired pathogens accounted for 71% of these isolates (40/56), with Pseudomonas species and Alcaligenes xylosoxidans representing 25% of the cases (14/56) and unusual microorganisms such as Nocardia spp and Aspergillus spp representing 3% (2/56). The most frequent microorganisms isolated were *H* influenzae from 27 patients (55%), different strains of Pseudomonas species from 13 (26%), and *S* pneumoniae from six (12%).

Three variables were associated with airway colonization with PPMs:

(1) Confirmation of diagnosis before the age of 14 years. Longer evolution of the disease, and patients diagnosed at an early age have a greater risk of recurrent respiratory infections and progressive bronchial damage

(2)Presence of varicose-cystic bronchiectasis on the HRCT scan

(3) FEV1 lower than 80% predicted.

Other authors have observed a correlation between the presence of bacteria in the airways (particularly P.aeruginosa) and lung function impairment. In this study series patients colonised with P.aeruginosa also had a lower FEV1 than other colonised patients, although the differences did not reach statistical significance.

According to James.D.Charmells et al, mortality was significantly higher in patients with chronic colonization compared with non colonized patients. The mortality rate varied significantly depending on the colonizing organism, with the highest mortality rates associated with the isolation of Pseudomonas aeruginosa and methicillin resistant Staphylococcus aureus [(4)]

In a study by Stephen.R.Holdsworth et al, Sputum samples appropriate for microbiological examination were collected in 94 subjects. The most commonly isolated bacterium was Haemophilus influenzae which was seen in 34 subjects. Other common bacteria isolated were Moxarella catarrhalis (9 patients), Pseudomonas aeruginosa (7 patients) and Staphylococcus aureus (5patients). 36 patients had no pathogenic bacterial growth [(27)]

In a study by Loebinger et al, of the variables shown to have an independent effect on mortality in bronchiectasis, P.aeruginosa has previously been shown to have infected patients with more extensive disease and severe airflow obstruction. 2 more studies have shown that infection leads to an increased progression of disease with a more rapid decline in lung function parameters [6]

The independent effect of infection with organism P. aeruginosa on mortality shown in this study suggests that it is likely to impact on patient's survival more than only being a marker of severity. Infection control measures, such as clinic segregation, to avoid patient exposure to the bacterium, should be investigated. Furthermore, treatment regimes designed to eradicate P. aeruginosa, when it occurs for the 1st time, has shown to have some benefits in delaying the decline of lung function in patients with cystic fibrosis, and may also have an impact on the progression of bronchiectasis.

According to Regis Bockard et al, Bacteriological examination could isolate the microbe in 35% of cases. In this study it was through examination of sputum cytology in 27% of cases, through examination of liquid bronchial aspiration in 5% cases, and through the direct examination of sputum for MTB in 3% of cases.

Microbes isolated were: Streptococcus pneumonia in 11 patients, Pseudomonas aeruginosa in 10 patients, Klebsiella pneumonia and Mycobacterium tuberculosis in 3 patients each; Moraxella catarrhalis, Haemophilus influenzae, E.coli, Citrobacter spp, Serratia marcescens, Mycoplasma pneumoniae, Acinetobacter baumannii and Staph aureus in one patient each. Through this work, the authors highlight that S.pneumoniae and P.aeruginosa are the most commonly isolated microbes in their study patients [8]

According to Miguel.A.Martınez-Garcı et al, of all the different combinations, the variable that finally demonstrated the greatest ability to independently predict the probability of the 5-year all-cause death was presence of chronic colonisation by Pseudomonas. aeruginosa. Neither presence of chronic colonisation by multiresistant Gramnegative bacilli nor isolation of Staphylococcus aureus or atypical mycobacteria or fungi, presented any significant independent predictive power for the mortality rate [10]

Therefore, it was decided to include only chronic colonisation by P. aeruginosa in the FACED score, as this is the only organism that has been related with an increase in mortality and a poor functional evolution in the patients with non-CF bronchiectasis

In a study by Paul.T.King et al, on initial assessment the most common bacterium isolated was Haemophilus. influenzae, present in 42 patients (47%) . The next most common bacteria were Pseudomonas. aeruginosa isolated in 11 patients (12%), Moxarella catarrhalis in 7 patients (8%) and Streptococcus. pneumoniae in 6 patients (7%). Only 3 patients had Staph. aureus isolated. 2 patients had Aspergillus spp. isolated from their sputum and 2 had Mycobacterium avium complex. A large number of patients (21%) had no pathogenic micro organisms isolated from their sputum [(10)]

Follow-up sputum samples were obtained over an average period of 6 years after initial review. Overall results were fairly similar to that of the initial review, with the predominant bacteria isolated being Haemophilus. influenzae present in 36 patients (40%) and Pseudomonas. aeruginosa isolated in 16 patients (18%). There was again a large proportion of subjects who had no pathogen isolated from their sputum which was seen in 23 patients (26%). A comparison was thus performed between the results of initial and the follow-up sputum samples. Follow-up sputum samples grew the same organism in 50 patients (56%). Of the 42 patients who had Haemophilus. influenzae isolated on their initial evaluation, 27 of these patients (64%) had the same isolated from their sputum on follow-up too. A similar picture was also observed in the 11 subjects with Pseudomonas. aeruginosa isolated on their initial assessment, 8 of whom (73%) had the same isolated organism again on follow-up.

Analysis showed that the subjects who had the same micro organism isolate on follow-up examination had a significantly higher number of exacerbation rate (3.571.9 per year) compared with that of the non colonized subjects (2.771.7) with an odds ratio of 1.3

Antibiotic susceptibility testing was performed for all the isolates. On initial assessment, 12 sputum isolates (13% of patients) showed antibiotic resistance. On follow-up review there was a higher level of resistance with 27 isolates (30%) demonstrating antibiotic resistance. Resistance to β-lactams in subjects with Haemophilus.influenzae, Streptococcus.pneumoniae or Moraxella. catarrhalis increased from 11% to 26%. Resistance to gentamicin in subjects with P. aeruginosa/ other Gram-negative pathogens increased from 14% to 39%.

Patients having resistant bacteria were significantly more likely to have been hospitalised and have had a greater number of exacerbations compared to those with sensitive bacteria. On an average, hospitalized patients had an odds ratio (OR) of 3.5 (95%) for the presence of antibiotic resistance compared to the non hospitalized patients, after controlling for the number of exacerbations. Similarly, every exacerbation increased the odds of having an antibiotic resistance by 41% after controlling for hospitalisation status.

As an overview of this study the most common isolates from sputum analysis in this cohort of bronchiectasis patients were Haemophilus.influenzae, no growth and Pseudomonas. aeruginosa. Over a half of this cohort was colonized with the same bacteria over a period of 5-year follow-up. Antibiotic resistance increased over the time and was associated with the frequency of exacerbations and hospitalization.

Studies have found that around 64–79% of patients with bronchiectasis are chronically infected with pathogenic micro organisms in their airways even when they are apparently clinically stable. The most common infecting pathogens are Haemophilus. influenzae (47–55%) and Pseudomonas. aeruginosa (12–26%). Other pathogens that are frequently responsible for chronic infection include Moraxella. catarrhalis, Streptococcus. pneumoniae and Staphylococcus. aureus. In a five-year follow-up study, 74% of patients remained chronically infected with the same micro organism responsible in more than half of the study population. 18 Non-tuberculous mycobacteria (NTM) are isolated from the sputum of these patients. It has been recognized as a cause as well as a complication of bronchiectasis.

A prospective study done on hundred patients with bronchiectasis in 2005 found out that the prevalence of NTM was 2%, with 1% requiring treatment. A similar later study found a prevalence of 9% (7 out of 80 patients), with only 2.5% requiring treatment. The exact prevalence of NTM infection in non-cystic fibrosis bronchiectasis needs further evaluation.

In the study by Jim Hwa lee et al, bacterial colonization in stable bronchiectasis differed from those of other studies. Several reports mainly in white patients found H. influenzae to be the predominant bacteria, and a recent trend toward more *P.* aeruginosa and less *H.* influenzae has been reported (31, 32). In the present study, *P.* aeruginosa was the outstanding microorganism, occupying 71% of culture-positive cases. Overuse or inappropriate prescription of oral antibiotics without anti-pseudomonal activity could explain the predominance of P. aeruginosa. Patients with colonization showed significantly lower FVC and FEV1 values than non-colonized patients [(7)]

Angrill et al. found that the reduced FEV1 was a risk factor of bronchial colonization. It is unclear as to which is the initiator for pulmonary functional deterioration, the bronchiectasis the colonizing bacteria at well. However, data showing decreased lung function and extensive bronchiectasis in HRCT associated with the colonization of pseudomonas. aeruginosa or any other potentially pathogenic microorganisms are accumulating [(3)]

In a recent study, non-colonized patients with bronchiectasis showed a more intense bronchial inflammatory reaction than the healthy controls, and patients colonized by potentially pathogenic microorganisms have also exhibited an exaggerated inflammatory reaction which was found to correlate with that of the bronchial bacterial load.

Isolates of Pseudomonas.aerugenosa may indicate the presence of underlying bronchiectasis, because once Pseudomonas infection is established in bronchiectasis patients by adhering to the respiratory epithelial cells and following colonization, it is rarely eliminated

Therefore, the phenomenon of chronic colonization, secondary inflammatory reaction, and progressive lung injury represents ‘a vicious cycle’ in bronchiectasis, and is the reason why the appropriate evaluation of distal airway colonization is necessary. Logistic regression analysis revealed that the presence of an air fluid level was the only significant independent predictor of bacterial colonization. Neither reduced lung function nor any other findings of HRCT were significant. Thus, the air-fluid levels can be considered as a marker of active infection and also as a guideline when prescribing antibiotics.

In a study by Paul Purcell et al, Sputum from 51 patients (73%) had culture positive for pathogenic microorganisms, the remaining either yielded no bacteria or non-pathogenic mixed oral flora. The most common organisms were Pseudomonas. aeruginosa found in 33% and Haemophilus. influenzae in 21% of patients respectively. There was no instance of both Pseudomona and H. influenzae being found within a single sample [(14)]

Records showed that 24 patients had P. aeruginosa isolated from all the previous sputum samples referred for culture; those patients were regarded as persistently colonised. There were around 17 patients regarded as intermittently colonised, with Pseudomonas. aeruginosa isolated from at least 1 but not all sputum samples and 29 patients were culture negative. The majority (71%) of frequent exacerbators (n = 38) were culture positive for lung pathogens. Of these patients, 50% were colonised with Pseudomonas. aeruginosa and 10.5% with H. influenzae.

In patients harbouring Haemophilus. influenzae or where culturable pathogens were absent FEV1% predicted was 64.5 and 64.9 respectively, these values were significantly higher in comparison with patients whose sputum was culture positive for Pseudomonas. aeruginosa (FEV1% predicted = 48.5). Lung function was also significantly lower ($P < 0.001$) in patients persistently colonized with Pseudomonas. aeruginosa (FEV1% predicted = 40.6) compared to those who were 'never' or intermittently colonised by this pathogen (FEV1% predicted 59.7 and 69.8 respectively). In contrast, those who were never colonised and those intermittently colonised did not have significant difference in FEV1% predicted values. Patients who frequently exacerbated (FEV1% predicted = 58.8) and those that did not exacerbate (FEV1% predicted = 59.3) had no significant difference in lung function.

King et al conducted several studies showing that Haemophilus. influenza ranked the most common pathogen (range: 29–70%), Pseudomonas. aeruginosa followed with a range of 12–31%.[37] While Shah *et al*. found that 32% for H. influenzae, 14% for Streptococcus. pneumoniae, 8% for Moraxella. catarrhails, 5% for Staph. aureus, and 2% for P. aeruginosa. Some studies of sputum microbiology and bronchoscopic sampling revealed that Staph. aureus occurred in non-CF bronchiectasis patients of 4–10%.[38] Stockley *et al*. found that the most common infected organisms isolated are H. influenzae and Strep. pneumoniae. In our study, the mean isolation rates was 29% for H. influenzae, 28% for Pseudomonas by using sputum, which were in accordance with King's results (5)

In a study done by Xia-Yi Miao et al, it was found that 11% for Strep. pneumoniae, 12% for Staph. aureus, and 8% for Moraxella. catarrhalis, which were similar with Shah study except the isolate rates of Pseudomonas. aeruginosa, which focused on children. Our study explored whether there were statistical differences between major pathogen rates by using two different methods among adults and children. Results of this analysis showed that Pseudomonas had a significant statistical difference among adults and children, while other 4 isolation rates of pathogens did not. This result can best interpret Shah's study that P. aeruginosa rate was lower in children. Clinically, patients infected with P. aeruginosa in non-CF bronchiectasis would bring about a rapid decline in lung function and earlier mortality. Hence, more attention should be paid to Pseudomonal infection (7)

BRONCHIECTASIS VS COMPLICATIONS:

According to a study by Ketaki utpat et al, an important finding of the study was that majority of the patients with pulmonary hypertension and cor-pulmonale had associated small airway disease (89% patients). This is in much contrast to the patients without associated airway disease, where only 1 patient developed cor-pulmonale. This may indicate that pure bronchiectatic changes very rarely result in pulmonary hypertension whereas associated small airway disease significantly contributes to the development of pulmonary hypertension and subsequent cor-pulmonale [23]

Secondary renal amyloidosis due to chronic suppuration as sequelae of bronchiectasis was suspected in 14% of the patients. In a retrospective evaluation of 40 cases to find causes of secondary amyloidosis excluding cases with causes other than bronchiectasis, secondary amyloidosis was identified in around 40% cases. Of the 18% patients who developed respiratory failure during the follow up period Type II failure was seen predominantly and it was seen in all (100%) who had evidence of small airway disease on HRCT. All of the hospitalizations were for respiratory failure, 57 percent of which could be managed by nasal oxygen and the rest 43% required noninvasive ventilation (NIV) for correction of hypoxemia.

22 % of these cases of respiratory failure also had concomitant right heart failure. This indicates that respiratory failure is uncommon in bronchiectasis patients were symptoms are adequately controlled, high incidence being in those patients who develop recurrent infective exacerbations or who have changes of small airway disease.

The presence of an average right and left main pulmonary artery diameter greater than 18 mm was found to be associated with a significant and substantial increase in mortality rate. (8 fold) among patients with bronchiectasis. By examining CT signs of pulmonary hypertension, it was found that increased pulmonary artery pressure is a significant complication in some patients with bronchiectasis and that evidence of pulmonary hypertension is the most important prognostic CT feature

MATERIALS AND METHODS

OBJECTIVE OF THE STUDY:

1. To study the clinical picture(symptomatology, duration of illness) & PFT analysis
2. To study the radiological pattern (xray and hrct chest),
3. To assess the microbiological profile (AFB smear, NT C&S)
4. To assess the complications arising in patients with bronchiectasis

AIM OF THE STUDY:

To analyse the common clinical picture, radiological pattern, PFT picture in bronchiectasis patient

To analyse the common microbiological flora so as to design appropriate management strategy so as to prevent complication

Study group: Patients with bronchiectasis

Study design: Cross sectional study

Place of Study: Govt Thiruvoteeswarar Hospital of Thoracic Medicine Chennai

Duration of study: 6 months

Sample size: 165

Sampling method: simple random sampling

Conflict of interest/ Hazards: Nil

METHODOLOGY:

Allowable alpha error is 5% with a confidence level of 95% and desired accuracy of 8% when prevalence of pseudomonas infection is 40% among bronchiectasis patients

Patients attending our OPD with cough with purulent expectoration, shortness of breath, fever, with/ without hemoptysis and radiological features favouring bronchiectasis or previously known/evaluated cases of bronchiectasis were included in our study. A register would be made for bronchiectasis patients in OPD to facilitate data collection and follow up and a nurse to inform me when a old / new case of bronchiectasis registers in OPD. After explaining the purpose of the study, consent will be obtained from the participating subjects.

A questionnaire will be given to them and information will be collected regarding the demographic data, childhood history, symptomatology and significant past and personal history. X RAY and HRCT chest will be done to assess the radiological involvement. AFB smear and non tuberculous bacterial culture and sensitivity will be done to assess the microbiological colonisation. PFT will be done for airway assessment.

DATA COLLECTION:

The data of each patient was collected on a proforma specially designed for this study.

- Occupation
- BMI
- Birth Order
- Exposure to recurrent infection
- Immunisation status
- Exposure to Farm Products
- Exposure to Smoke
- **SYMPTOMATOLOGY:**
- Cough with expectoration
- Shortness of breath
- Hemoptysis:
- Fever:
- **PAST HISTORY:**
- Prior TB treatment:
- Childhood exanthematous fevers
- Hospitalisation for pneumonia/ respiratory infection
- Any comorbid illness (DM/SHT/BA/COPD/epilepsy/HIV/CAD)

- **PERSONAL HISTORY:**
- Addictions
- Marital status
- Children
- **PFT**
- **X RAY CHEST**
- **HRCT CHEST**
- **SPUTUM AFB**
- **SPUTUM CULTURE &SENSITIVITY**

BODY MASS INDEX

The body mass index (BMI) or Quetelet index is a value derived from the mass (weight) and height of an individual. The BMI is defined as the body mass divided by the square of the body height, and is universally expressed in units of kg/m2, resulting from mass in kilograms and height in metres.

The BMI is an attempt to quantify the amount of tissue mass (muscle, fat, and bone) in an individual, and then categorize that person as underweight, normal weight, overweight, or obese based on that value.

Patient's body weight is measured to nearest 0.1 kg with subjects in light clothing and patients' height is measured by asking them to stand barefoot with their backs and heels touching a vertical bar to the nearest 0.5 cm and BMI is calculated. Drawback of BMI is it does not assess changes in body composition.

BMI	**NUTRITIONAL STATUS**
<18.5	Underweight
18.5-24.9	Normal
25-29.9	Overweight
>30	Obese

CHEST X-RAY IN BRONCHIECTASIS:

The chest x-ray may be abnormal and show the presence of increased pulmonary markings, ring-like structures, atelectasis, dilated and thickened airways (tram lines), and mucous plugging (finger-in-glove) appearance; however, the chest radiograph may even be normal even in the presence of bronchiectasis[22]

HRCT IN BRONCHIECTASIS:

MAJOR AND SUPPLEMENTARY HRCT FEATURES OF BRONCHIECTASIS

Major signs

- Bronchial dilatation
  - Signet ring sign (vertical bronchi)
  - Nontapering or flaring bronchi (horizontal bronchi)
- Identification of bronchi within 1 cm of pleura (not adjacent to mediastinum)
- Mucoid impaction in dilated bronchi

Supplementary signs

- Bronchial wall thickening
- Plugging of centrilobular airways (tree-in-bud)
- Volume loss of affected lobe
- Area of decreased attenuation (mosaicism)
- Interlobular septal thickening

A bronchus is considered to be dilated if it's internal diameter is more than that of the pulmonary artery branch that accompanies it, measurements conventionally made in the short axis of both the bronchus and the vessel. Such changes may cause a 'signet ring' appearance. The lack of normal bronchial tapering towards the periphery of the lung is seen in such subjects. Bronchial wall thickening is said to be present if the wall thickness is at least equal to the diameter of the adjacent pulmonary artery branch. The occurrence of bronchial wall thickening prior to the development of bronchial dilatation has been described in patients with hypogammaglobulinaemia.

Air trapping on expiration is demonstrated as areas of increased transradiancy in patients with severe bronchiectasis, this having a negative correlation with FEV1. CT scanning during both inspiration and expiration can be used to distinguish between areas of cystic bronchiectasis and emphysematous bullae, where the bronchiectatic cysts changes in size with phases of respiration whereas the bullae do not. A good HRCT technique has been able to demonstrate the different morphological types of bronchiectasis: cystic bronchiectasis typically shows grouped ring shadows, representing clusters of dilated bronchi that may contain mucopus, sometimes with air–fluid levels; cylindrical bronchiectasis shows dilatation that remains relatively uniform as the bronchus extends peripherally; and varicose bronchiectasis, in which the affected bronchus assumes a beaded appearance. HRCT has been found to have a greater sensitivity than spiral CT in patients suspected with bronchiectasis.

STATISTICAL ANALYSIS

Statistical analysis was done using the Microsoft Excel and SPSS software with the help of a statistician. P value is used to assess the significance of correlation between variables. A statistically significant correlation is one in which

Pearson correlation is used to assess the strength of correlation between variables

Pearson correlation:

> 0.5 - Strong correlation

0.3 to 0.5 – Moderate correlation

0.3 - Weak correlation

Chi-square Test:

Chi-square test is performed between two groups and its statistical significance is calculated.

The chi-square ($\chi 2$) test of independence is used to test for a statistically significant relationship between two categorical variables.

The term "degrees of freedom" is used to refer to the size of the contingency table on which the value of the Chi Square statistic has been computed

P value is calculated using Excel CHITEST function:

If P value $\leq 0.05 \rightarrow$ statistically significant

If P value $> 0.05 \rightarrow$ statistically insignificant

RESULTS

TABLE 1: GENDER WISE DISTRIBUTION OF STUDY SUBJECTS

SEX	Frequency	Percent
Male	78	47.3
Female	87	52.7
Total	165	100.0

53% of the study population were females and 47% males. This is in accordance to studies which prove a higher female preponderance

FIG 1: GENDER WISE DISTRIBUTION OF STUDY SUBJECTS

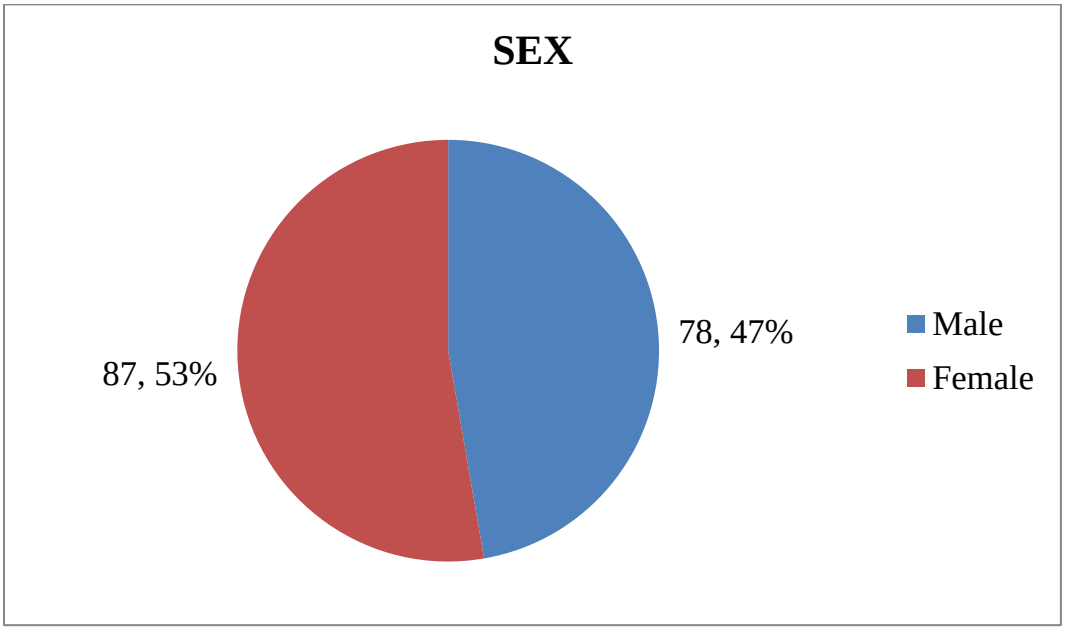


TABLE 2: AGE WISE DISTRIBUTION OF THE STUDY SUBJECTS

Age cat	Frequency	Percent
11-20	2	1.2
21-30	7	4.2
31-40	20	12.1
41-50	60	36.4
51-60	56	33.9
>60	20	12.1
Total	165	100.0

The mean age of the study population was 49. The minimum age was 20 and maximum was 69. The maximum clustering was 36% in the age group of 41-50 years and 34% in 51 – 60 years. Literature shows increased prevalence in advancing age groups

FIG 2: AGE WISE DISTRIBUTION OF THE STUDY SUBJECTS

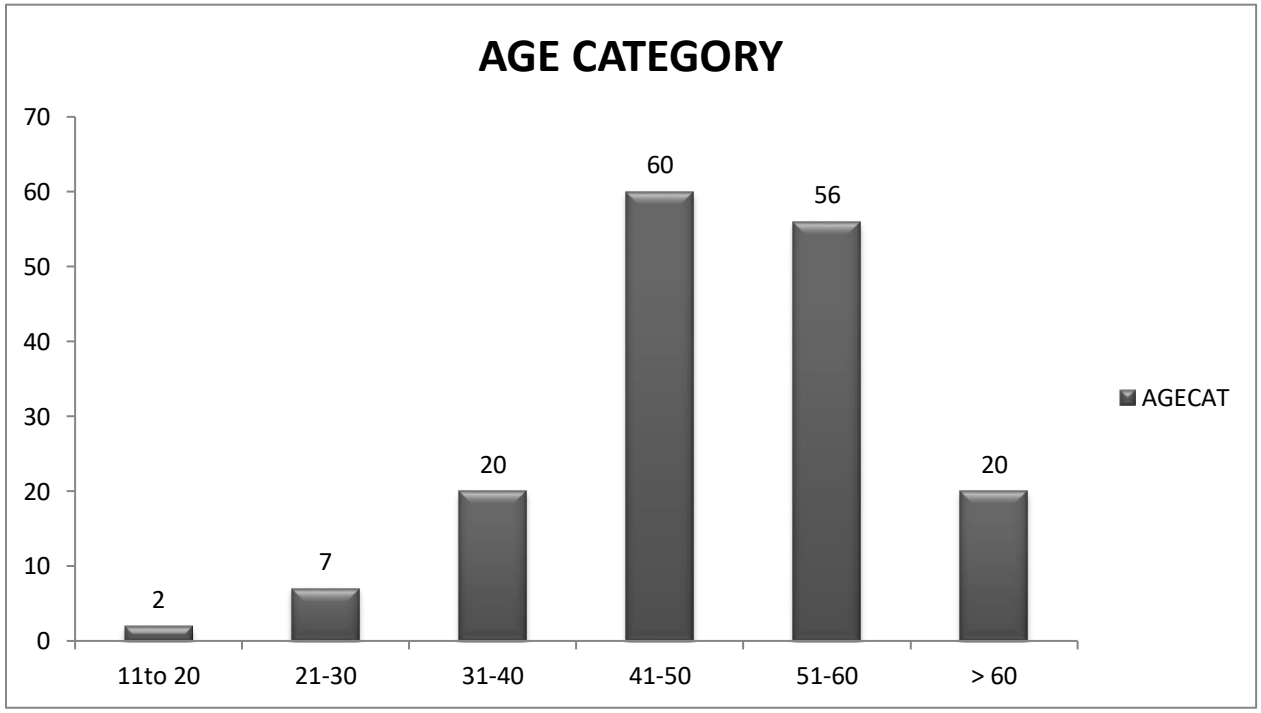


TABLE 3: BMI DISTRIBUTION OF THE STUDY SUBJECTS

BMI CATEGORY	Frequency	Percent
<18.50	19	11.5
18.5 to 24.9	135	81.8
25-29.9	11	6.7
Total	165	100.0

The mean BMI was 21.17, with minimum BMI as 16 and maximum as 28. Majority were in the normal range of 18.5 – 24.9(81.8%). Patients were more prone to RRTIs, hypoprotenemia and persistent breathlessness in advanced stages causing a low mean BMI

FIG 3: BMI DISTRIBUTION OF THE STUDY SUBJECTS

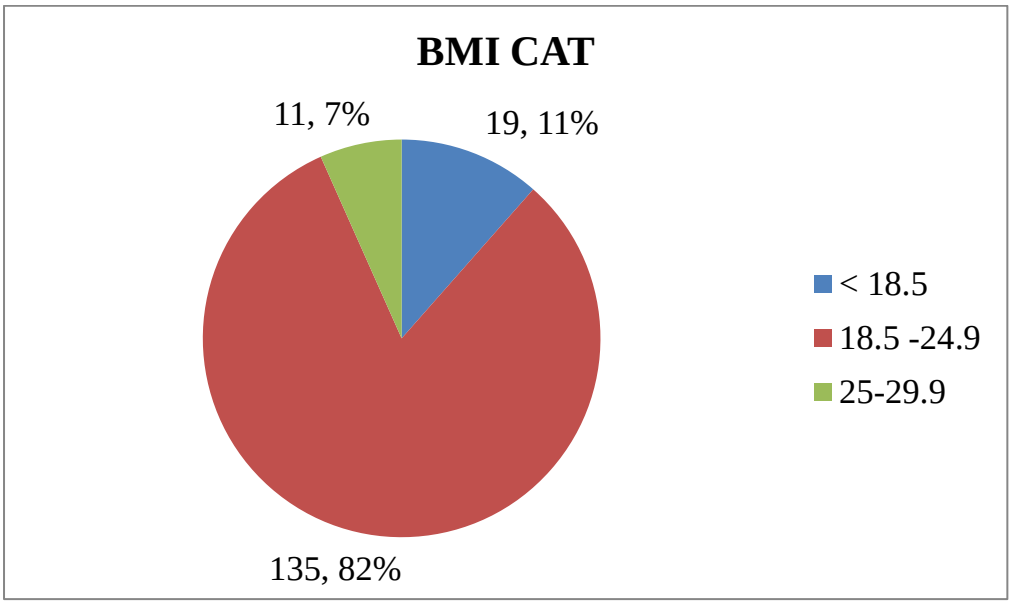


TABLE 4: CHIEF COMPLAINTS OF STUDY PATIENTS

Chief Complaints	Frequency	Percent
Breathlessness	81	49.1
Cough	38	23
Cough with sputum	86	52.1
Chest pain	2	1.2
Fever	13	7.9
Hemoptysis	7	4.2

Cough with purulent sputum was the common presenting complaint in 52% patients and a cough in 23%. Cough with sputum is the hallmark of bronchiectasis. It is associated with breathlessness in advanced stages as seen in 49% of the study population

FIG 4: CHIEF COMPLAINTS OF STUDY PATIENTS

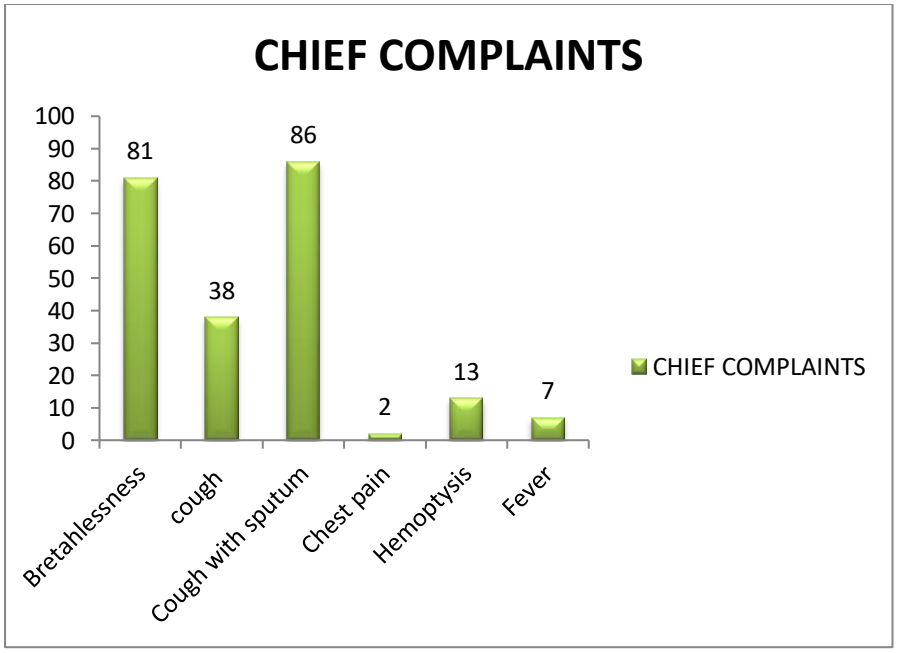


TABLE 5: SMOKING PREVELANCE IN STUDY PATIENTS

Smoking H/O	Frequency	Percent
Smoker	30	18.2
Ex- Smoker	32	19.4
Non Smoker	103	62.4
Total	165	100.0

62% of our study population were smokers with 19% as ex smokers and 18% as current smokers. This may be due to increased female population in our study. Smoking further accentuates airway inflammation increasing breathlessness and worsening prognosis

FIG 5: SMOKING PREVELANCE IN STUDY PATIENTS

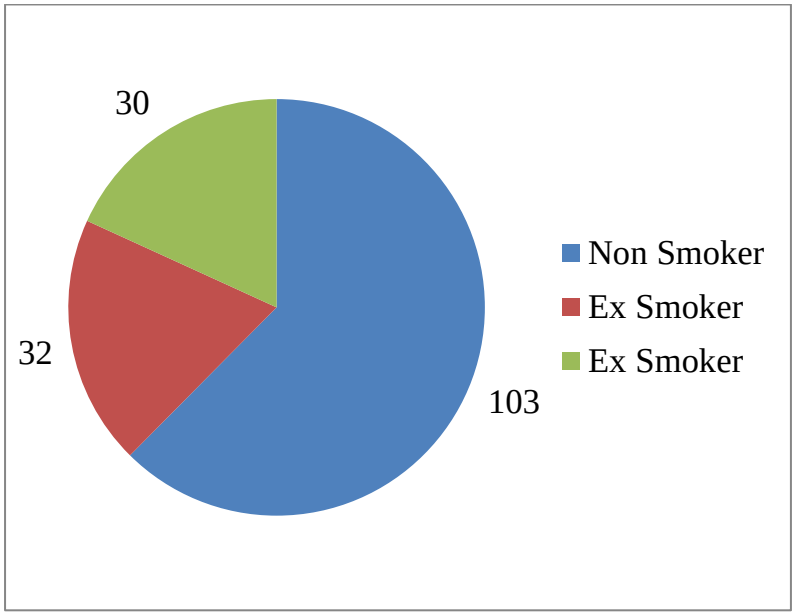


TABLE 6: ETIOLOGY OF STUDY PATIENTS

Etiology	Frequency	Percent
Pneumonia	14	8.5
ABPA	2	1.2
RRTI	26	15.8
No	65	39.4
TB	54	32.7
Viral Exanthem	4	2.4
Total	165	100.0

No definite etiology could be identified in 40% of patients, Post tuberculous in 33%. Idiopathic and post infectious are the most common etiology according to studies. Immunological profile would be needed for a full work up. India being a TB endemic country post TB constitutes the highest infectious cause

FIG 6: ETIOLOGY OF STUDY PATIENTS

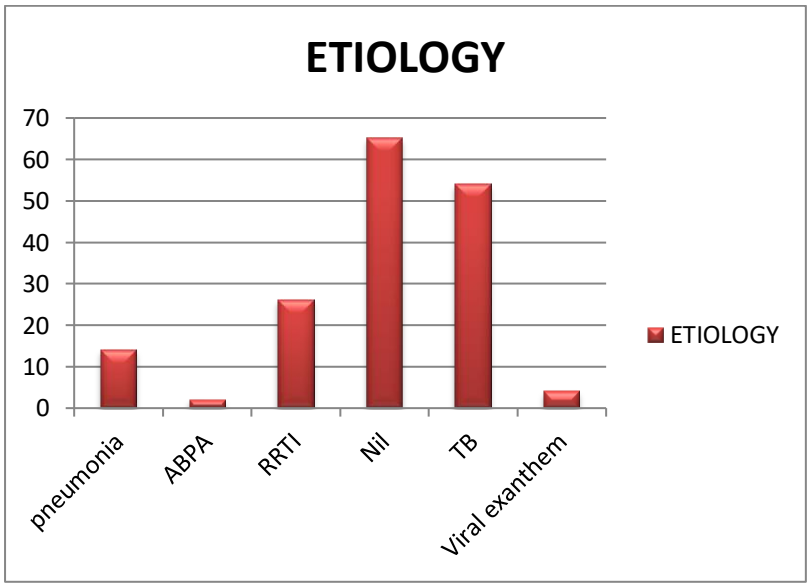


TABLE 7: COMORBITIES OF STUDY PATIENTS

Co-morbidities	Frequency	Percent
Bronchial Asthma	3	1.8
Diabetes Mellitus	51	31
IHD	11	6.7
SHT	9	5.4
Nil	101	61

Diabetes was the most commonly associated comorbidity seen in 31% of population which may be due to high prevalence of TB in diabetics, as well as their increased risk of pneumonia requiring hospitalisations

FIG 7: COMORBITIES OF STUDY PATIENTS

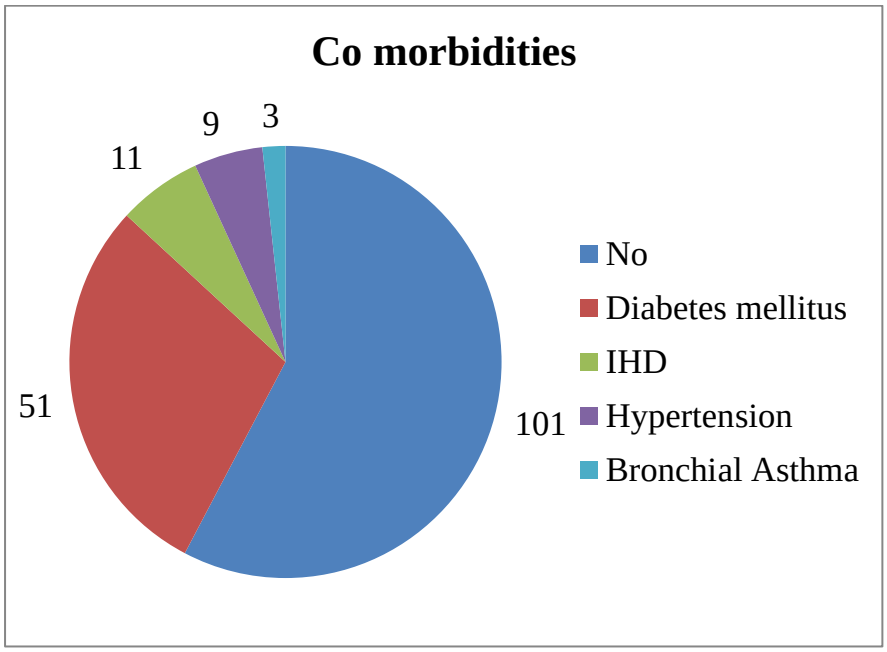


TABLE 8: PFT PATTERN OF STUDY PATIENTS

PFT	Frequency	Percent
Normal	64	38.8
Restrictive	5	3.0
Obstructive	75	45.5
Mixed	21	12.7
Total	165	100.0

Obstructive type is the most common PFT pattern in 46% of study population which may be due to underlying COPD as well chronic airway inflammation with stasis of secretions

FIG 8: PFT PATTERN OF STUDY PATIENTS

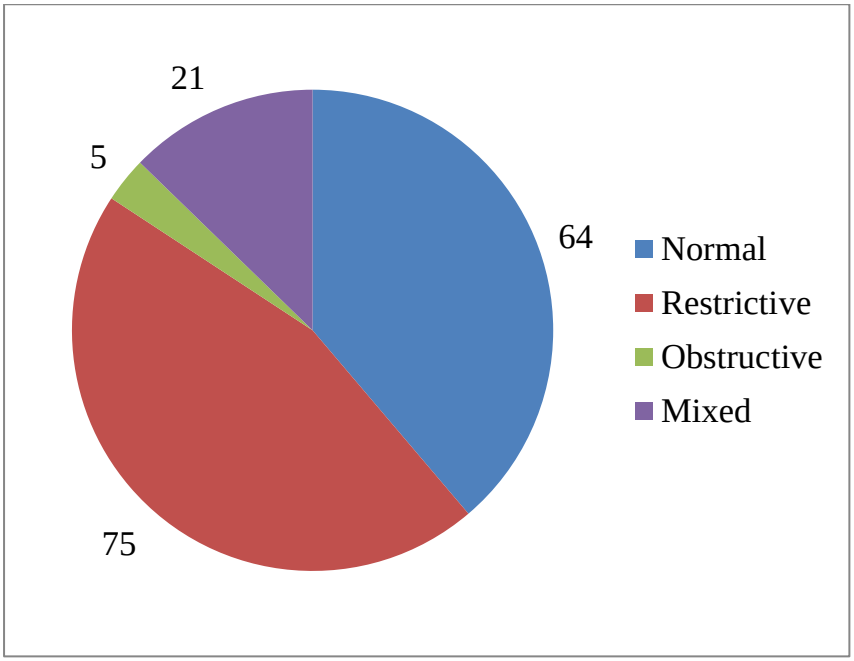


TABLE 9: X-RAY PATTERN OF STUDY PATIENTS

X-RAY Finding	Frequency	Percent
Right sided	66	40.0
Left sided	48	29.1
Bilateral	51	30.9
Total	165	100.0

Right sided involvement was seen in 40% and bilateral in 31% of study subjects. X ray appearance usually showed ecstatic changes or ring shadows with cystic air spaces

FIG 9: X-RAY PATTERN OF STUDY PATIENTS

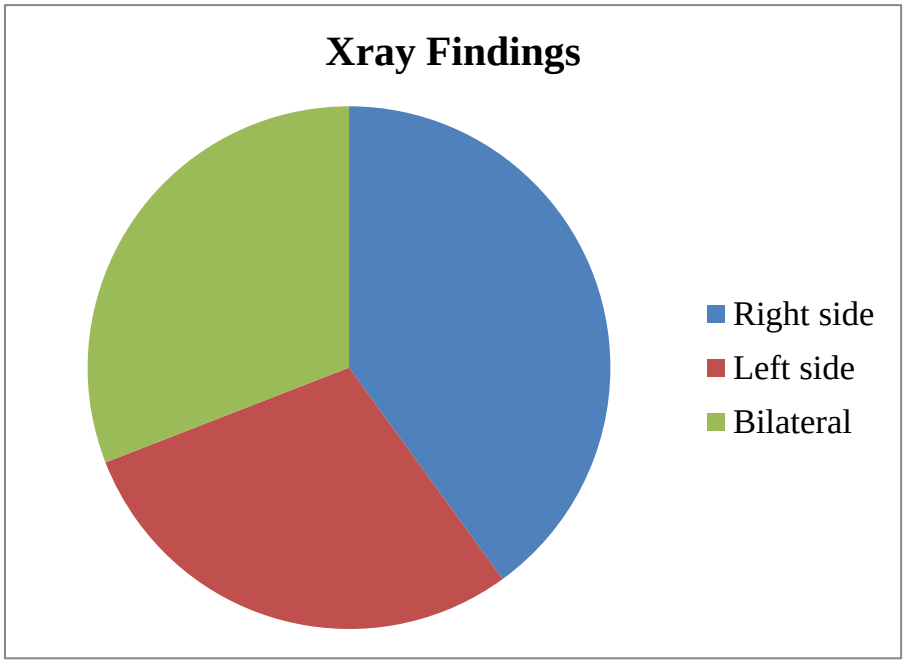


TABLE 10: HRCT PATTERN OF STUDY PATIENTS

HRCT	Frequency	Percent
Right sided	75	45.5
Left sided	47	28.5
B/L involvement	43	26.1
Total	165	100.0

HRCT showed bilateral involvement in 26% of study population. The more the numbers were involved, more extensive was the disease and poorer the outcome

FIG 10: HRCT PATTERN OF STUDY PATIENTS

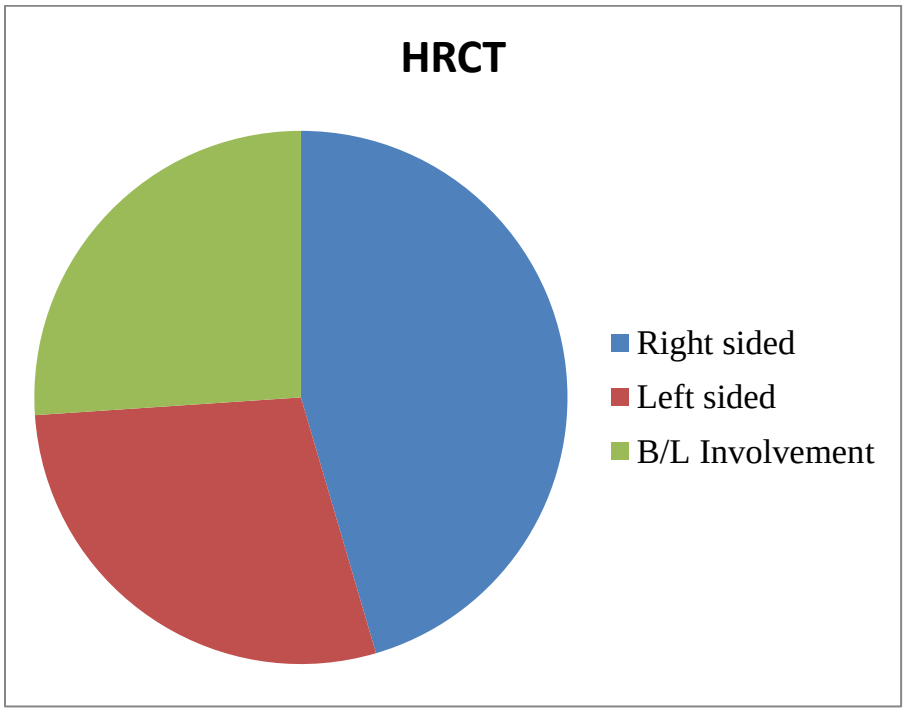


TABLE 11: RADIOLOGICAL PATTERN OF STUDY PATIENTS

Type	Frequency	Percent
Cystic	43	26.1
Cylindrical	97	58.8
Mixed	15	9.1
Traction	2	1.2
Varicose	8	4.8
Total	165	100.0

59% of the patients had cylindrical bronchiectasis, while 26% had cystic type. Some literatures show cystic as common type while some show cylindrical. Increased post tuberculous bronchiectasis in our study might have lead to increased cylindrical types

FIG 11: RADIOLOGICAL PATTERN OF STUDY PATIENTS

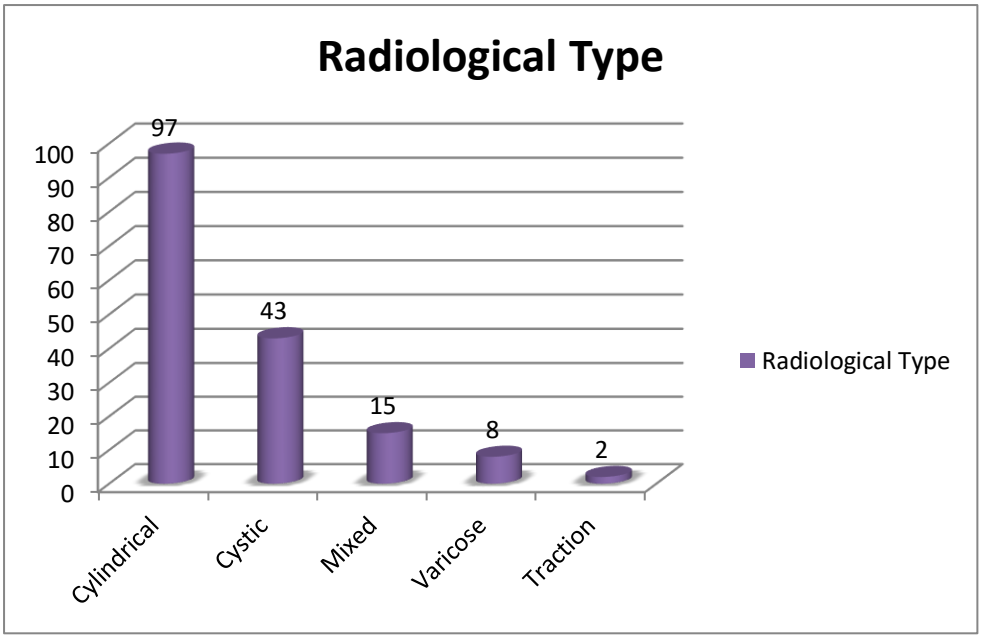


TABLE 12: NUMBER OF LOBES INVOLVED IN STUDY PATIENTS

No of lobes Involved	Frequency	Percent
1	40	23.8
2	70	42.7
3	26	15.9
4	22	13.4
5	4	2.4
6	3	1.8
Total	165	100.0

43% of patients had involvement of 2 lobes. Study also showed more patients with multilobar involvement, with 3 patients having involvement of all 6 lobes.

FIG 12: NUMBER OF LOBES INVOLVED IN STUDY PATIENTS

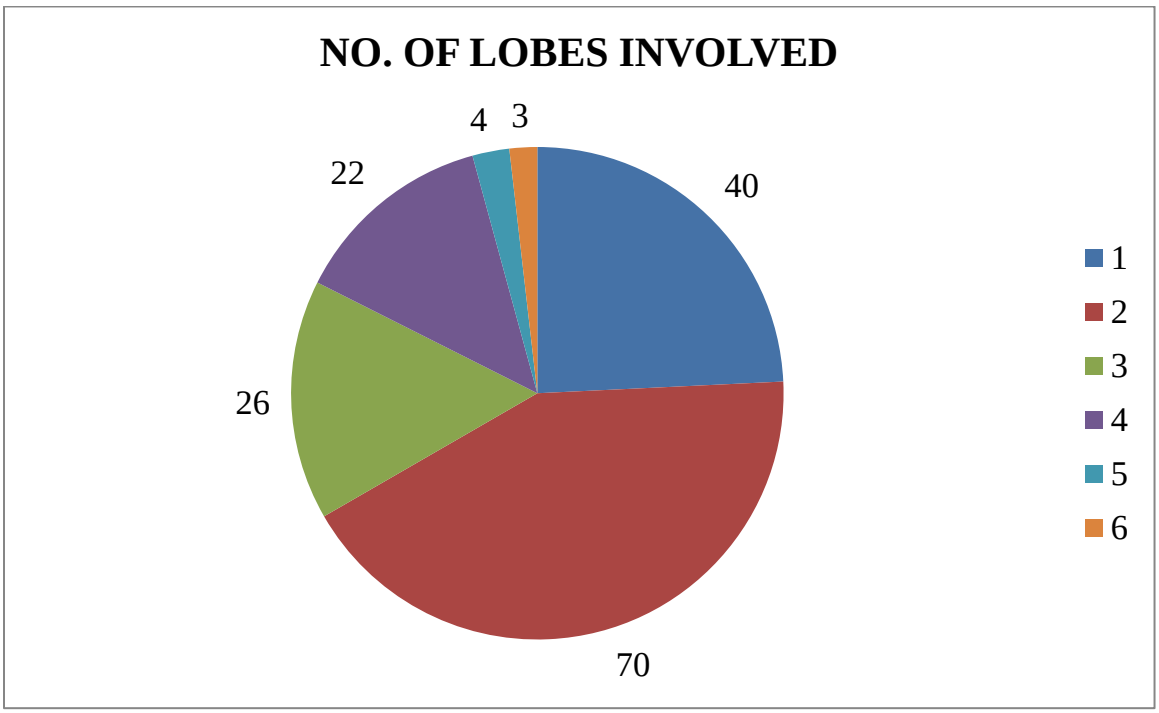


TABLE 13: SPUTUM AFB OF STUDY PATIENTS

Sputum AFB	Frequency	Percent
Positive	4	2.4
Negative	161	97.6
Total	165	100.0

4 patients had sputum positivity for AFB smear. TB may rarely present as bronchiectasis itself or it may develop as a complication of bronchiectasis or a reactivation of previous pulmonary tuberculosis. 1 among this 4 had an INH monoresistant TB

FIG 13: SPUTUM AFB OF STUDY PATIENTS

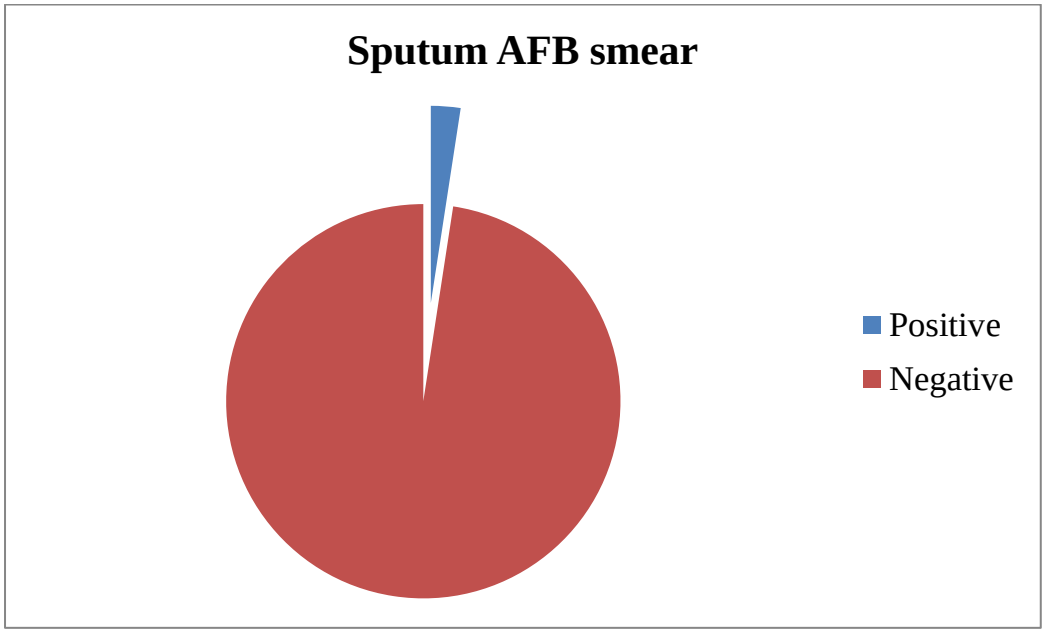


TABLE 14: SPUTUM CULTURE OF STUDY PATIENTS

Sputum culture	Frequency	Percent
Pseudomonas aeruginosa	43	26
Haemophilus.Influenza	17	10.3
Acenitobacter	13	7.8
Escherichia.Coli	30	18.2
Fungal Hyphae	3	1.8
Klebsiella	44	26.7
Mycobacterium Absceccus	1	0.6
TB	2	1.2
Streptococcus pneumonia	16	9.6
Staphylococcus aureus	14	8.5
Negative	15	9

Sputum culture is an important parameter in the management of bronchiectasis. Pseudomonas and klebsiella were the common micro organisms isolated in 26% of population. Studies show increased prevalence of pseudomonas followed by H. influenza. In our study H.influenza was seen in 11% of population

FIG 14: SPUTUM CULTURE OF STUDY PATIENTS

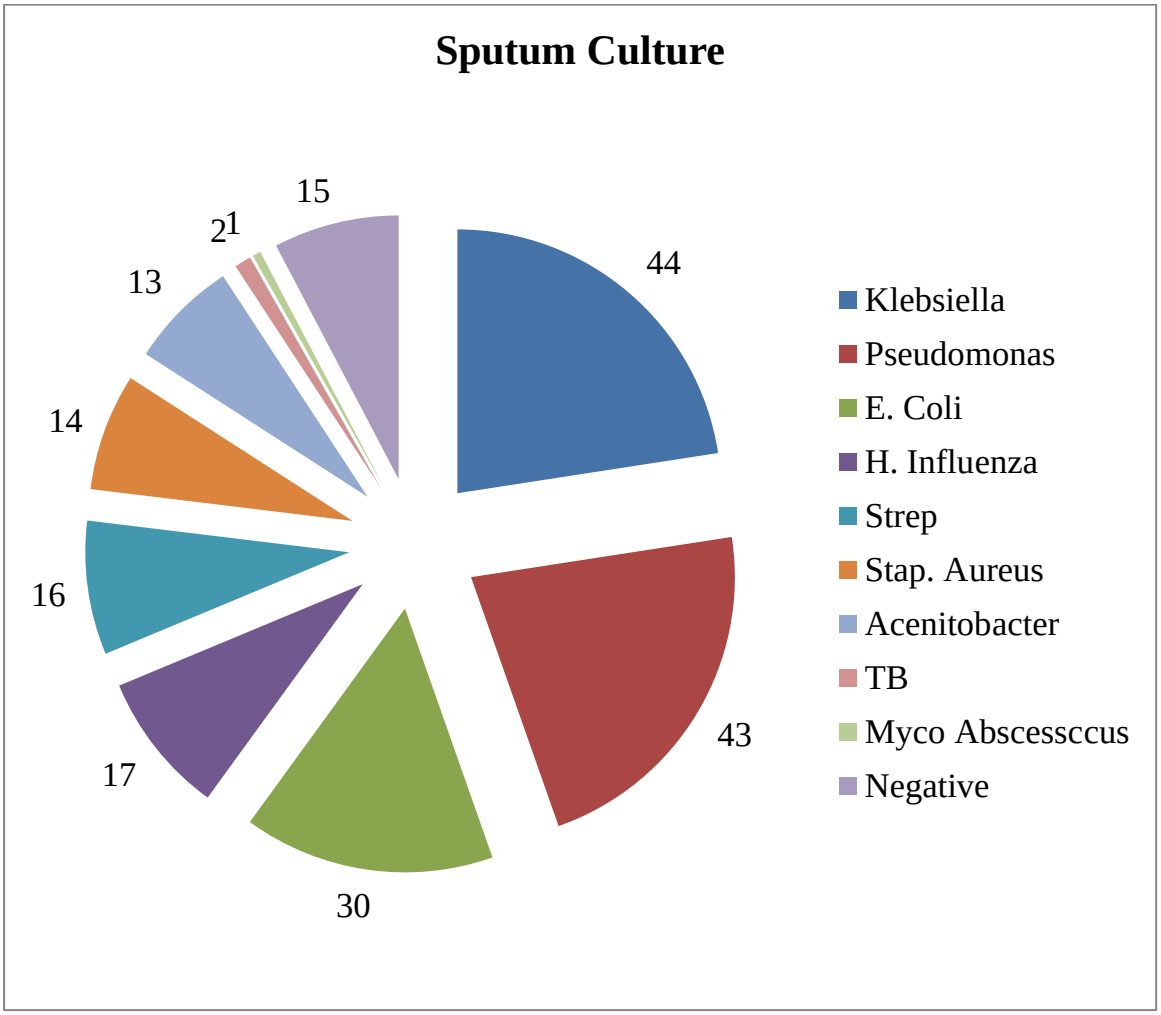


TABLE 15: COMPLICATIONS IN STUDY PATIENTS

Complications	Frequency	Percent
Hemoptysis	37	22.4
Cor Pulmonale	17	10.3
PHT	17	10.3
No	99	60

Hemoptysis was the most common complication seen in 22% of the population. PHT and corpulmonale were seen in 10% each. 60% of the subjects did not have complications

FIG 15: COMPLICATIONS IN STUDY PATIENTS

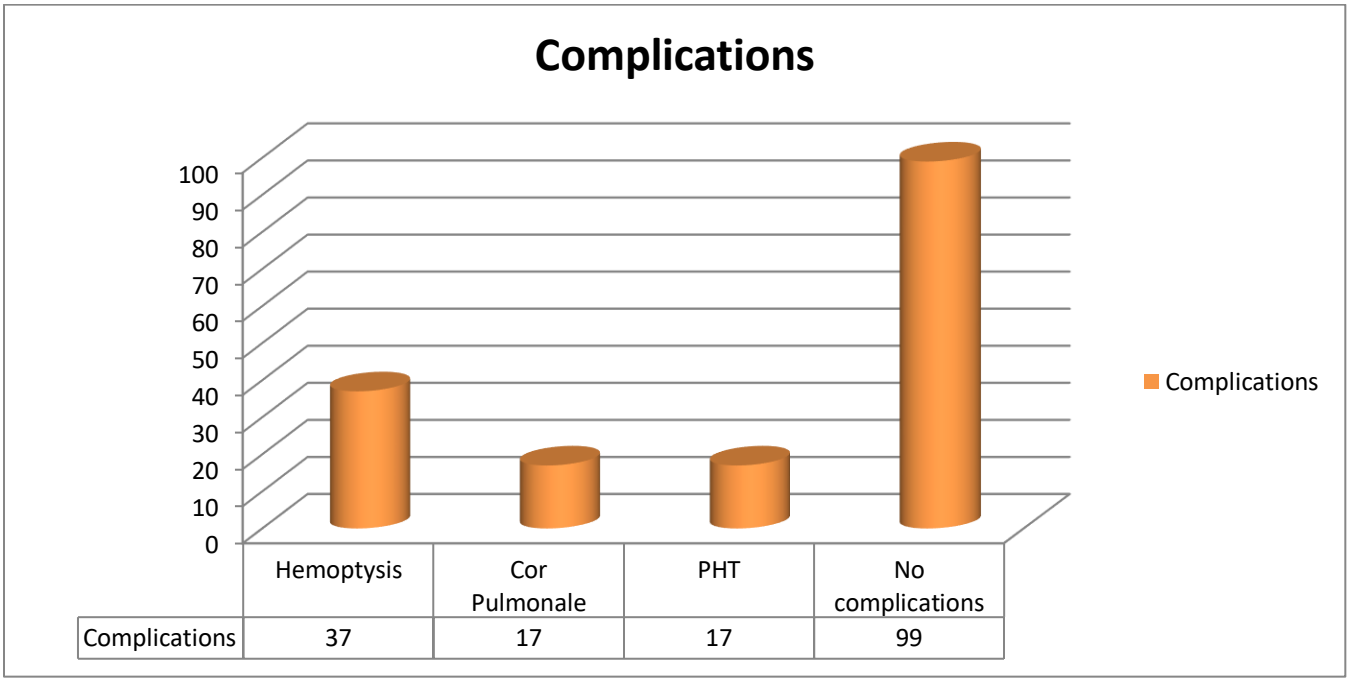


TABLE 16: CORRELATION BETWEEN CHIEF COMPLAINTS AND DEATH IN STUDY PATIENTS

S.no	Chief Complaints	Frequency	Alive	Dead	P value
1	Breathlessness	81	71	10	0.03*
2	Cough	38	34	4	0.49
3	Cough with sputum	86	80	6	0.65
4	Chest pain	2	2	0	0.84
5	Fever	13	12	1	0.9
6	Hemoptysis	7	6	1	0.52

The most common symptom associated with death was breathlessness as it was seen in disease progression. It had a statistical correlation of p = 0.03. The other important symptom was cough with purulent sputum as it is a cardinal sign seen in majority of patients

TABLE 17: CORRELATION BETWEEN ETIOLOGY AND DEATH

ETIOLOGY			Total
	Alive	Dead	
ABPA	2	0	2
Hospitalisation for pneumonia	14 100.0%	0 0.0%	14 100.0%
Nil	63 96.9%	2 3.1%	65 100.0%
RRTI	21 80.8%	5 19.2%	26 100.0%
RRTI/TB	1 100.0%	0 0.0%	1 100.0%
TB	46 88.5%	6 11.5%	52 100.0%
TB/ABPA	1 100.0%	0 0.0%	1 100.0%
viral exanthema	4 100.0%	0 0.0%	4 100.0%
	152	13	165

Most common etiology associated with death was TB as it was the major identified cause

TABLE 18: CORRELATION BETWEEN RADIOLOGICAL TYPE AND DEATH IN STUDY PATIENTS

S.No	RADIOLOGICAL TYPES			Total
		Alive	Dead	
1	Cystic	37	6	43
		86.0%	14.0%	100.0%
2	Cylindrical	92	5	97
		94.8%	5.2%	100.0%
3	Mixed	13	2	15
		86.7%	13.3%	100.0%
4	Traction	2	0	2
		100.0%	0.0%	100.0%
5	Varicose	8	0	8
		100.0%	0.0%	100.0%
Total		152	13	165

P value < 0.05

Cystic type was more associated with death because of it's destructive nature and increased propensity for colonization by pseudomonas bacteria

TABLE 19: CORRELATION BETWEEN COMORBITIES AND DEATH IN STUDY PATIENTS

S.No	Co morbidities	Frequency	Alive	Dead	P value
1	Bronchial Asthma	3	3	0	0.71
2	Diabetes Mellitus	51	46	5	0.59
3	IHD	11	11	0	0.31
4	SHT	9	7	2	0.1
5	Nil	101	94	7	0.38

There was not much clinical or statistically significant association of presence of comorbities and death in our study population

TABLE 20: CORRELATION BETWEEN CULTURE ORGANISM AND DEATH IN STUDY PATIENTS

Presence of pseudomonas in culture has a significant correlation with death, as it is more prone for destruction and persistent colonization. So the new guidelines targets treatment for eliminating pseudomonas colonisation

S.no	Sputum culture	Frequency	Alive	Dead	P value
1	Pseudomonas	43	35	8	0.02
2	H.Influenza	17	16	1	0.74
3	Acenitobacter	13	11	2	0.29
4	E.Coli	30	26	4	0.19
5	Fungal Hyphae	3	3	0	0.78
6	Klebsiella	44	41	3	0.76
7	Mycobacterium Absceccus	1	1	0	0.92
8	TB	2	1	1	0.15
9	Negative	15	15	0	0.23
10	Streptococcus pneumoniae	16	15	1	0.79
11	Staphylococcus aureus	14	14	0	0.25

S.NO	Complications	Frequency	Alive	Dead	P value
1	Hemoptysis	37	32	5	0.14
2	Cor Pulmonale	17	9	8	0.001
3	PHT	17	15	2	0.53
5	No	99	99	0	0.001

TABLE 21: CORRELATION BETWEEN COMPLICATIONS AND DEATH IN STUDY PATIENTS

Though hemoptysis is the most common complication in our study patients, the major complication associated with death is cor pulmonale which has a clinical as well as statistical correlation with a p value = 0.001. Chronic bronchiectasis leads to pulmonary hypertension, right atrial and ventricular dilatation eventually leading to cor pulmonale

TABLE 22: CORRELATION BETWEEN SPUTUM CULTURE AND TYPE OF BRONCHIECTASIS IN STUDY PATIENTS

S.no	Sputum culture	Frequency	cystic	cylindrical	mixed	traction	Varicose	P value
1	Pseudomonas	43	27	14	1	0	1	0.001
2	H.Influenza	17	1	13	1	1	1	0.10
3	Acenitobacter	13	8	4	1	0	0	0.04
4	E.Coli	30	10	14	2	4		0.43
5	Fungal Hyphae	3	1	2	0	0	0	0.92
6	Klebsiella	44	10	25	7	0	2	0.39
7	Mycobacterium Absceccus	1	1	0	0	0	0	0.58
8	TB	2	1	0	0	0	1	0.03
9	Negative	15	0	15	0	0	0	0.02
10	Strep.pneumonia	16	5	7	2	0	2	0.48
11	Staph.aureus	14	2	11	0	0	1	0.47

Pseudomonas has a clinically and statistically significant correlation with cystic type of bronchiectasis with a p value of 0.001.among the 43 patients positive for pseudonas culture, 27 had a cystic type. They persistently colonise in the cystic type leading to their worse prognosis and increased mortality

TABLE 23: CORRELATION BETWEEN SPUTUM CULTURE AND NUMBER OF LOBES INVOLVED IN STUDY PATIENTS

S.No	Sputum culture	Frequency	1	2	3	4	5	6	P value
1	Pseudomonas aeruginosa	43	5	8	12	12	3	2	0.001
2	H.Influenza	17	3	4	5	4	0	1	0.16
3	Acenitobacter	13	0	6	2	2	1	2	0.02
4	E.Coli	30	10	14	2	4	0	0	0.43
5	Fungal Hyphae	3	1	2	0	0	0	0	0.98
6	Klebsiella	44	12	9	6	7	0	0	0.66
7	Mycobacterium Absceccus	1	0	1					0.92
8	TB	2	0	2					0.73
9	Negative	15	6	9					0.13
10	Strep.pneumonia	16	4	5	4	2	1	0	0.71
11	Staph.aureus	14	3	7	2	2	2	0	0.96

As the number of lobes involved increases, higher is a chance of pseudomonas being isolated in culture. It has a statistically significant p value of 0.001

DISCUSSION

AGE DISTRIBUTION OF THE STUDY POPULATION:

The age in our patients ranged from 10-60 years. The mean age is 49. The number of patients in the age group 10-20, 21-30, 31-40, 41-50, 51-60 and >60 are 2(1.2%), 7 (1.4%), 20 (12.1%), 60 (36.4%), 56 (33.9%) and 20 (12.1%) respectively. About 70% of the study subjects with bronchiectasis were in the age group of 40 to 60 years which denotes a higher prevalence of asthma in 5th and 6th decade which is usually documented in literature.

GENDER DISTRIBUTION OF THE STUDY POPULATION:

We had included 165 patients for our study according to inclusion and exclusion criteria. Out of them 78 were males, which constitutes 47.3% of the study subjects and remaining 87 were female which constitutes 52.3% of the study population. The ratio of male to female sex ratio is slightly higher on the female side which reflects the higher prevalence of bronchiectasis in female gender which is usually documented in the literatures.

BMI DISTRIBUTION OF THE STUDY POPULATION:

When the subjects were classified according to body mass index, we found that about 11 subjects i.e. 34% of the study population belonged to overweight category. Majority of the subjects 135 i.e. 81.8% were included under normal BMI. 19 of the subjects i.e.11.5 % were underweight.

DISTRIBUTION OF STUDY SUBJECTS ACCORDING TO THEIR CHIEF COMPLAINTS:

Cough with purulent expectoration was the chief complaint in 86 patients, i.e. 52.1% of the study population. Followed by breathlessness in 81 subjects (49.1%), cough in 38 subjects (23%), fever in 13 subjects (7.9%), hemoptysis in 7 (4.2%) and chest pain in 2 subjects (1.2%). This was according to literature, where cough and breathlessness are the major presenting complaints of patients with bronchiectasis

DISTRIBUTION OF STUDY SUBJECTS ACCORDING TO SMOKING HISTORY:

103 patients (62.4%) were non smokers. 32 patients (19.4%) were ex smokers and 30 (18.2%) were smokers. Smoking history is important because COPD is an important comorbity for patients with bronchiectasis, which is associated with severe morbidity and poor outcome.

DISTRIBUTION OF STUDY SUBJECTS ACCORDING TO ETIOLOGY:

65 subjects (39.4%) did not have an identifiable prior etiology, past history of TB with anti tuberculous treatment was seen in 54 subjects (32.7%). History of recurrent lower respiratory tract infections was seen in 26 subjects (15.8%), history of prior hospitalization and treatment for pneumonia was seen in 14 subjects (8.5%), history of childhood viral exanthema was seen in 4 subjects (2.4%) and ABPA in 2 (1.2%) subjects.

This is in accordance with literature, where idiopathic and post infectious are the most common causes of bronchiectasis.

DISTRIBUTION OF STUDY SUBJECTS ACCORDING TO COMORBITIES:

101 patients (61%) did not have any comorbities. Diabetes was the most common associated comorbity seen in 51 patients (31%), IHD in 11 patients (6.7%), systemic hypertension in 9 patients (5.4%), bronchial asthma in 3 patients (1.8%). Diabetic patients were more prone to pneumonia, TB and infective causes, that justifies it's increased prevelance in patients with bronchiectasis.

PFT ANALYSIS IN PATIENTS WITH BRONCHIETASIS:

The most common PFT observation was an obstructive type in 75 patients (45.5%), followed by a normal spirometry in 64 patients (38.8%), mixed in 21 patients (12.7%) and restrictive in 5 patients (3%). Obstructive pattern is predominant due to airway inflammation and stasis of secretions, which are common in patients with bronchiectasis, thereby contributing to it's increased percentage.

X-RAY FINDINGS IN PATIENTS WITH BRONCHIECTASIS:

The most common X-ray findings in our study patients were ring shadows, ecstatic changes and cystic lesions. Right sided lesions were seen in 66 patients (40%), while left sided lesions in 48 patients (29.1%) and bilateral lesions in 51 patients (30.9%). This is according to literature which suggests right sided predominant disease pattern

HRCT FINDINGS IN PATIENTS WITH BRONCHIECTASIS:

The common presentations of bronchiectasis in HRCT are the cylindrical, cystic and varicose types. In our study majority of patients had cylindrical type, 97 patients (58.8%), cystic type in 43 patients (26.1%), varicose in 8 patients (4.8%) and mixed in 15 patients (9.1%). Some studies show cystic as the predominant type, while some studies suggest cylindrical as the most common type of bronchiectasis. As our study had a majority of post infectious cases, which might have lead to increased cylindrical sub type.

HRCT showed right sided lesions in 75 patients (45.5%), left sided in 47 patients (28.5%) and bilateral in 43 patients (26.1%).

Number of lobes involvement is also an important criteria for bronchiectasis scoring and deciding on the prognosis. In our study majority of patients had involvement of 2 lobes, 70 patients in 42.7% of population. The next common being 40 patients (23.8%) with single lobe involvement, 26 patients (15.9%) with 3 lobe involvement, 22 patients (13.4%) with 4 lobe involvement and 4 patients (2.4%) with 5 lobe involvement. 3 patients (1.8%) had involvement of all 6 lobes. Radiological evidence of involvement of 3 or more lobes involvement has a negative correlation with prognosis

SPUTUM AFB IN STUDY PATIENTS:

Among the 165 patients, 4 had sputum positive for AFB smear. In which 1 case was a relapse of TB, with LPA showing INH mono resistance pattern. Thus proving mycobacterium tuberculosis may also present/ complicate in patients with bronchiectasis

SPUTUM CULTURE IN STUDY PATIENTS:

The most important aspect for disease treatment and preventing complications in patients with bronchiectasis is microbiology. In our study, the most common micro organism isolated is pseudomonas aeruginosa and klebsiella in 43 patients each (26%), followed by E.coli in 30 patients (18.2%), H.influenza in 17 patients (10.3%), Streptococcus pneumonia in 16 patients (9.6%), Staphylococcus. aureus in 14 patients (8.5%), acinetobacter in 13 patients (7.8%), fungal hyphae in 3 patients (1.8%) and mycobacterium absceccus in 1 patient (0.6%). 15 patients (9%) did not have any growth in their culture. According to studies pseudomonas is the common isolated organism which also has a destructive nature and tendency for chronic colonization further worsening the symptoms. It was followed by H.influenza, streptococcus pneumonia which was seen predominantly. Other organisms isolated were klebsiella, staphylococcus aerues, acinetobacter etc. non tuberculous mycobacteria is emerging as one of the important cause for colonization even in immune competent individuals. 15 – 20% of patients may also be negative for any pathogenic bacterial growth.

COMPLICATIONS IN STUDY PATIENTS:

The most common complication in our study subjects was hemoptysis which was seen in 37 patients (22.4%), pulmonary hypertension in 17 patients (10.3%) and cor pulmonale in 17 patients (10.3%). There was no complications in 90 patients (60%). 16 patients died during the course of treatment.

CORRELATION BETWEEN CHIEF COMPLAINTS AND DEATH:

The most common presenting complaint in patients with bronchiectasis who died during the study period was breathlessness, which was seen in 10 subjects with a significant p value < 0.03. The other common symptoms were cough with with purulent expectoration. Many of the patients with long standing bronchiectasis were prone to development of pulmonary hypertension and cor pulmonale, which presented as exertional breathlessness.

CORRELATION BETWEEN ETIOLOGY AND DEATH:

Post tuberculous bronchiectasis (11 patients) was the most common etiology associated with death in our study subjects. The next common being recurrent lower respiratory tract infections since childhood (5 patients). As our study comprised of more number of patients with prior anti tuberculous treatment with co existing structural lung damage, such a correlation is present. Though there is a clinical significance, statistical significance could not be accounted.

CORRELATION BETWEEN COMORBITIES AND DEATH:

No comorbidity had a significant association with the outcome of our study patients. Though diabetes mellitus is a frequent association with patients having a poor outcome, it does not amount to a clinical or statistically significant value in our study patients with bronchiectasis

CORRELATION BETWEEN BRONCHIECTASIS TYPE AND DEATH:

The most common type of bronchiectasis associated with death was the cystic type seen in 6 patients followed by cylindrical type in 5 patients. Cystic type is usually considered as a destructive type with more predeliction for chronic bacterial colonization and a poor outcome. As our study had more of cylindrical type, a statistically significant correlation between the cystic type and death could not be achieved.

CORRELATION BETWEEN MICROBIOLOGY AND DEATH:

Pseudomonas aeruginosa was the most common organism isolated in patients with bronchiectasis as well as those who died during the study period. It has a p value of 0.02. followed by E.coli and klebsiella. Pseudomonas has tendency to form persistent colonies, with 50% patients having pseudomonas growth even on repeated cultures. It is also commonly seen in the destructive cavitatory type and more prone to develop complications of morbidity and mortality. Thus susceptible antibiotics should be initiated earlier to prevent colonization and complications.

CORRELATION BETWEEN SPUTUM CULTURE AND TYPE OF BRONCHIECTASIS:

27 patients with pseudomonas growth had a cystic type of bronchiectasis, which was of clinical significance as well as a statistical significance with a p value of 0.001. E.coli and klebsiella colonization was seen in 10 cases of cystic bronchiectasis each and acinitobacter in 8 cases of cystic bronchiectasis.

CORRELATION BETWEEN SPUTUM CULTURE AND NUMBER OF LOBES INVOLVED:

More the number of lobes involved, more were the chances of pseudomonas colonization. Pseudomonas was seen in 5 patients with single lobe involvement, 8 with 2 lobes, 12 with 3 lobes, 12 with 4 lobes, 3 with 5 lobes and 2 patients had involvement of all 6 lobes (lingual also counted as one lobe). There was a statistically significant correlation with a p value of 0.001. Other organisms associated with increased number of lobes involvement were H.influenza and acenitobacter.

CONCLUSION

- Bronchiectasis patients (n=165) in our study presented with cough with purulent expectoration(n=86), hemoptysis (n=37) and dyspnea (n= 81)
- The next commonest cause identified was post infectious with prior ATT treatment in 33% (n=54)
- Bronchiectasis exacerbations are associated with marked FEV1 and FVC deterioration, most common being obstructive type of PFT in 45%(n=75)
- Pseudomonas was the commonly isolated micro organism (n=43) and is associated with disease severity. Pseudomonas colonization was predominantly seen in the destructive cystic type of bronchiectasis and has predilection for involvement of more number of lobes, and significant correlation with death(p=0.001)
- 70% of the participants were middle aged, i.e; 40 – 60 years (n=116) and 12% were malnourished (n=19)
- Cor pulmonale significantly correlated with death (n=8) (p=0.001)

To conclude this study brings out the entire profile of patients with bronchiectasis and correlation of these paramaters with one another. This will help in a more directed way of treatment, early identification and prevention of complications. Periodic spirometric assessment, microbiological culture and detailed clinical examination has proven to be a significant modality in preventing morbidity and mortality.

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ABBREVIATIONS

HRCT – High Resolution Computed Tomography

PFT - Pulmonary Function Test

FVC – Forced Vital Capacity

FEV1 – Forced Expiratory Volume in 1 second

DLCO – Diffusion capacity of the Lungs for Carbon Monoxide

RV – Residual volume

TLC – Total Lung Capacity

COPD – Chronic Obstructive pulmonary disease

MTB – Mycobacterium Tuberculosis

NTM – Non Tuberculous Mycobacteria

ABPA – Allergic Broncho Pulmonary Aspergillosis

PPM – Potentially Pathogenic Micro organisms

RRTI – Recurrent Respiratory Tract Infections

PHT – Pulmonary hypertension

NIV – Non Invasive ventilation

BAL – Broncho Alveolar Lavage

CF – Cystic Fibrosis

CFTR – Cystic Fibrosis Transmembrance Conductance Regulator

PROFORMA

PATIENT'S DEMOGRAPHY

Id No:

Date:

Name:

Age:

Gender:

Address:

Phone:

Occupation: _____

BMI

Underweight	(Below 18.5)
Normal	(18.5-24.9)
Overweight	(25.0-29.9)
Obese	(30 and above)

CHILDHOOD HISTORY

Birth Order	_____
Exposure to recurrent infection	RS/GIT
Immunisation status	_____
Exposure to Farm Products	Yes/No
Exposure to Smoke	Yes/No

SYMPTOMATOLOGY:

Cough with expectoration	Yes/No
Shortness of breath	Yes/No
Hemoptysis	Yes/No
Fever:	Yes/No

PAST HISTORY:

Prior TB treatment:	Yes/No
Childhood exanthematous fevers:	Yes/No
Hospitalisation for pneumonia/ respiratory Infection:	Yes/No
Any comorbid illness: (DM/SHT/BA/COPD/epilepsy/HIV/CAD)	Yes/No

PERSONAL HISTORY:

Addictions:	Smoking/ alcohol/ tobacco/ substance abuse
Marital status:	married/ unmarried
Children:	Yes/No

PFT:

X RAY CHEST:

HRCT CHEST:

SPUTUM AFB:

SPUTUM NT C&S

ETHICAL COMMITTEE APPROVAL CERTIFICATE

INSTITUTIONAL ETHICS COMMITTEE
GOVT. KILPAUK MEDICAL COLLEGE,
CHENNAI-10
Protocol ID. No. 32/2018 Meeting held on 09.01.2018

The Institutional Ethical Committee of Govt. Kilpauk Medical College, Chennai reviewed and discussed the application for approval " TO STUDY THE CLINICAL, RADIOLOGICAL AND MICROBIOLOGICAL PROFILE OF PATIENTS WITH BRONCHIECTASIS IN A TERTIARY CARE HOSPITAL" submitted by Dr.R.DHIVYA, Post Graduate in TB and Respiratory diseases,Govt. Kilpauk Medical College, Chennai-10.

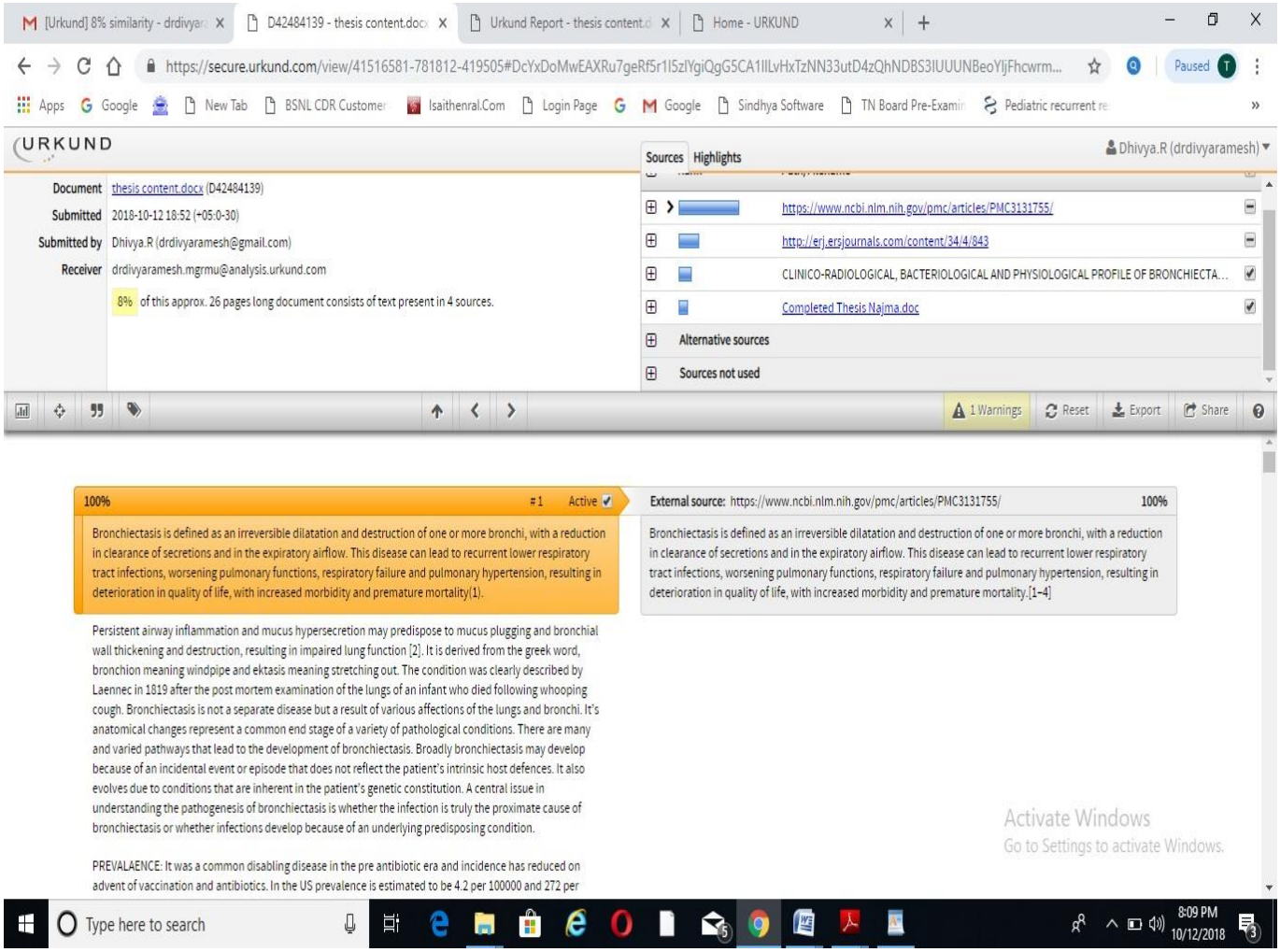
The Proposal is **APPROVED.**

The Institutional Ethical Committee expects to be informed about the progress of the study any Adverse Drug Reaction Occurring in the Course of the study any change in the protocol and patient information /informed consent and asks to be provided a copy of the final report.

DEAN
Govt. Kilpauk Medical College,
Chennai-10.

ME 1 Sec> Ethical Committee

URKUND ORIGINALITY CERTIFICATE



CERTIFICATE - II

This is to certify that this dissertation titled "TO STUDY THE CLINICAL, RADIOLOGICAL AND MICROBIOLOGICAL PROFILE OF PATIENTS WITH BRONCHIECTASIS IN A TERTIARY CARE HOSPITAL" of the candidate

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